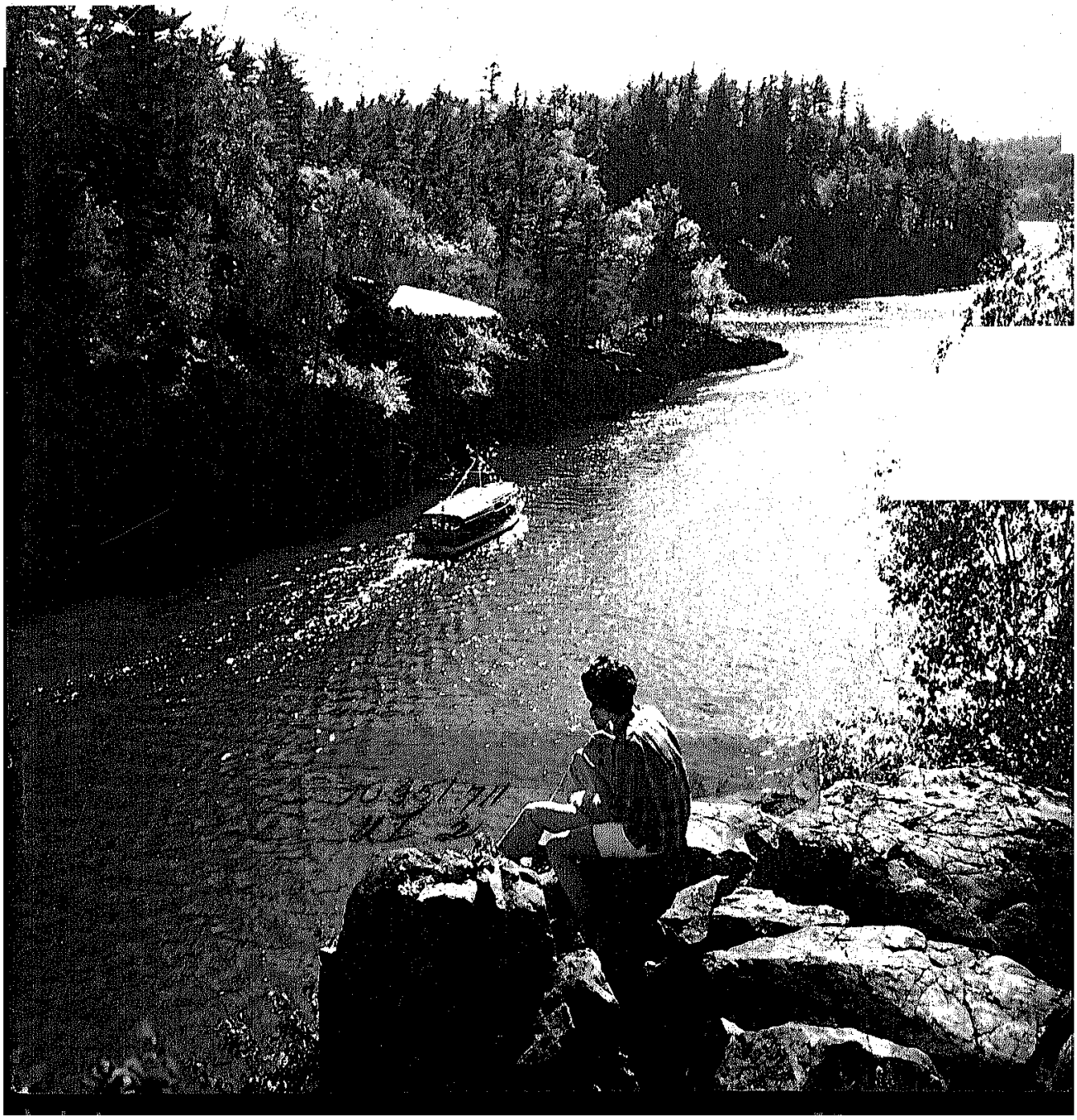
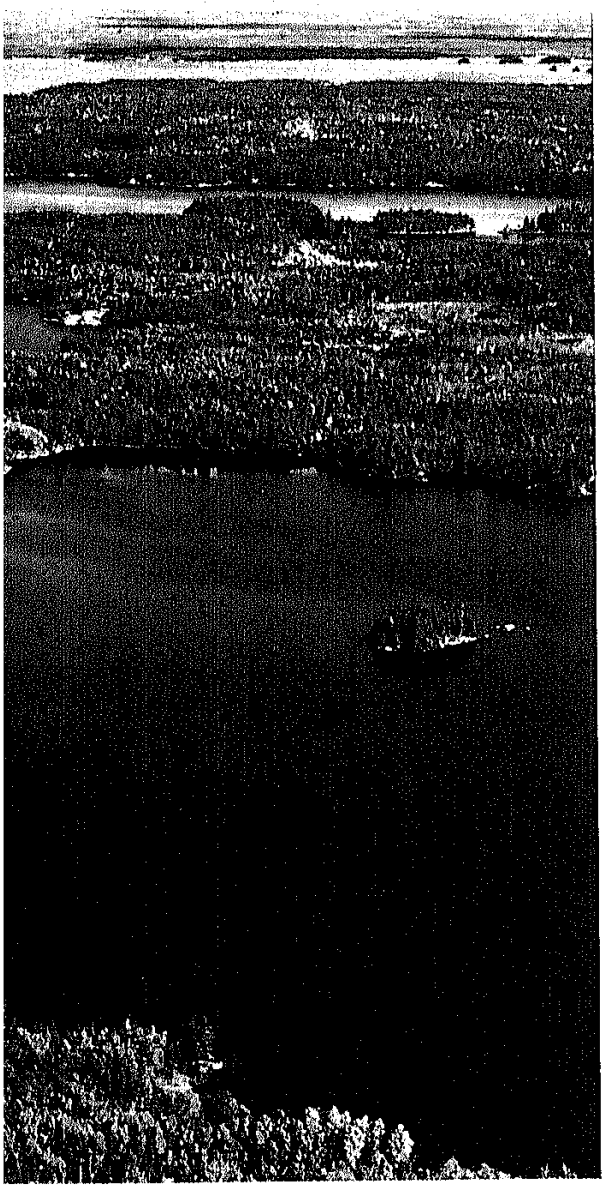
Natural Resources of...

MINNESOTA

Published by the United States Department of the Interior • Walter J. Hickel, Secretary





The purpose of this booklet is to bring a new awareness on the part of the American people of our rich natural resource heritage, its history, its present, and its future. To know our land is to love it and cherish it and protect it from the ravages both of nature and man.

Walter J. Hickel
Secretary of the Interior

(Left) Voyageurs traveled the lakes and streams of northern Minnesota transporting furs and goods in their canoes.

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The North Star State

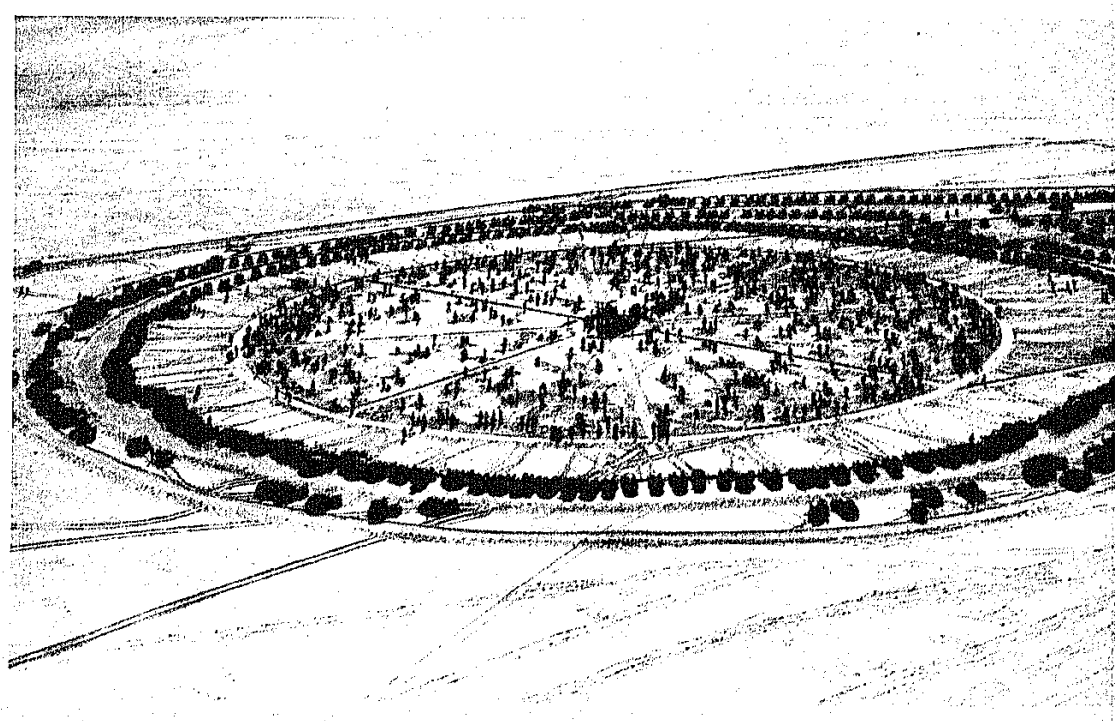
Perhaps the climate is responsible for attracting a hardy stock of people; or perhaps the abundance of timber to be hewed and iron to be mined acted as a magnet only to those strong enough to perform this work. Whatever the reason, Minnesota's history is the story of men who resemble Paul Bunyan in stature. Whether voyageurs, lumberers, miners, farmers, or railroad workers, each group that came to Minnesota added an interesting chapter to the story of the State.

French Explorers

The French were the first Europeans to explore this region. In 1660, Radisson and Groscilliers, who were returning to Montreal from their second voyage west, brought the first authentic news to other Europeans of the tribes of the Great Lakes and of the vast wealth which was waiting to be exploited. In 1679, Du Luth traveled the shores of Lake Superior and explored the area between the Mississippi and St. Croix Rivers. He claimed the territory in the name of the King of France. Another Frenchman, Father Hennepin, was sent by La Salle with Auguelle and Accault up the Mississippi. It was Hennepin who named the Falls of St. Anthony beside which Minneapolis grew. Other French explorers came through the region, but it was the voyageurs who had the most profound influence.

Voyageurs and the Fur Trade

Voyageurs, who escorted goods or men by water to fur-trading posts, opened the territory to Europeans and established friendly relations with the Indians. They were expert in handling their canoes



since a few seconds of inattention or indecision could be disastrous. Dressed in red or blue wool cap, with waist sash, and with white clay pipe in mouth, the voyageur presented a colorful picture.

Official French influence began to wane and with the beginning of the French and Indian War, many Frenchmen rushed to the East. Half a century of British domination of the fur trade followed the war.

In 1783, the eastern part of Minnesota came under the jurisdiction of the newly formed United States, and in 1803, through the Louisiana Purchase, the United States obtained the land west of the Mississippi. However, British fur companies continued to occupy their posts until the end of the War of 1812. Then, Congress passed a law reserving fur-trading privileges for U.S. citizens, and John Jacob Astor's American Fur Company began to control the trade. Throughout this period voyageurs simply shifted their citizenship with each change in power and continued their business until the fur trade declined in the 1840's.

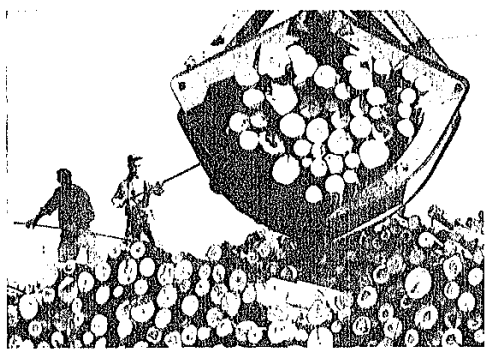
First Settlers

By 1819, the area now known as Minnesota needed policing and the Army sent Col. Henry Leavenworth to establish a post. His troops first camped at the site of Mendota, then moved across the Minnesota River. In 1820, under the direction of Col. Josiah Snelling, construction began on Fort St. Anthony, later named Fort Snelling. At this fort, five families from Lord Selkirk's colony at Pembina "squatted," becoming the first strictly agricultural settlers in the State. In 1840, they were expelled and moved downstream to found St. Paul.

In 1847, settlement began on the east side of the Falls of St. Anthony, and 2 years later, a group of houses was erected on the west side. Bridges connected the two towns and they merged, forming Minneapolis.

None of these settlements were self-sustaining. Many of the necessities of life were brought in by steamboat; roads were mere trails; and schools and churches were few and far between.

However, with the opening of the land office at



(Far left) Sportsmen, who have driven their cars onto the ice, try their luck at ice fishing. (Top left) Workers pile pulp wood at a storage yard. (Bottom left) Combines move across a field.

St. Croix Falls in 1848, came the first great wave of settlers.

From Territory to State

On March 3, 1849, the Territory of Minnesota was formally created. However, the growing population could not be restricted to the relatively small area of unclaimed land within the territory's borders. Indian lands were too enticing. The Sioux in 1851, were induced, through the treaties of Traverse des Sioux and Mendota, to relinquish their claims to a great deal of land in Iowa, Minnesota, and South Dakota and to move to a tract of land along the upper Minnesota River. The Chippewa also relinquished lands—lands which were valuable areas for lumbering.

After the proclamation of the Sioux treaties in 1853, there was another influx of settlers. Steamboats on the Mississippi, Minnesota, and St. Croix Rivers were crowded with passengers; other people came by the overland route. Most were eager for land sold by the Government for $1.25 an acre.

Villages sprang up overnight, and sawmills were kept busy supplying lumber for new buildings. In 1851, the university which was later to become the State university was chartered; Hamline University was chartered in 1854 and St. John's, in 1857.

For 2 years, from 1855 to 1857, land speculation was a booming business. Land which in the morning was worth $500 might be worth $1,000 by nightfall. "Inside information" about the route of the railroad was a commodity of the sharper, eager to get the highest price possible. Everyone was looking for the "quick dollar."

With the collapse of eastern business in 1857 and the resulting depression, it became clear that schemes to get rich quick just would not work. People then had to adjust to the idea that through hard work they could cultivate the rich land, and if insects, drought, or prairie fires did not destroy their crops, they could earn a living.

Minnesota was admitted to the Union on May 11, 1858, becoming the 32d State.

Civil War Period

When the news of Fort Sumter's capture reached Washington, D.C., Minnesota's Governor Alexander

Ramsey was in the Nation's Capital. Ramsey rushed to the War Department and offered 1,000 men from Minnesota, "the first tender of troops from any quarter after the fall of the Charleston fortress." But troops from the North Star State had barely reached the front when one of the most serious Indian uprisings in the country's history erupted in Minnesota.

Indian problems had by no means been solved by the treaties of Traverse des Sioux and Mendota. The Sioux resented being charged unfair prices for supplies; they also accused Government agents of distributing food unfit for consumption. With the demand for Civil War supplies superseding all other needs, neither money nor sufficient food was forthcoming for the Indians in the summer of 1862. A minor incident caused the entire Sioux Nation of about 7,000 to unite in an uprising in which 1,500 braves went on the warpath.

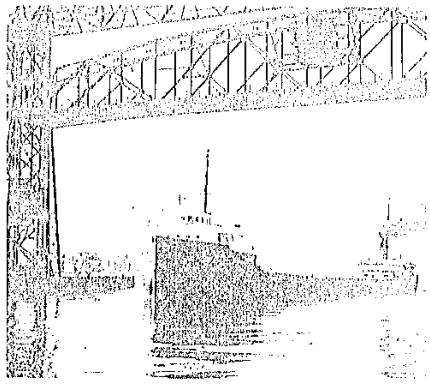
The result was inevitable. However, not until many families were massacred did Federal troops defeat the Sioux.

Lumbering and Milling

Although the first sawmill was built at the Falls of St. Anthony in 1822, the lumbering boom did not begin until 1870. Minnesota was merely a temporary stop for an army of woodsmen who were sweeping across the country hewing trees for a growing nation.

The lumberjacks believed in hardwork and hardliving. They showed their courage and skill in logrolling, jam-breaking, and raft-piloting. At night, lumber towns reeled with drunken brawls and rowdy good humor.

After the turn of the century, the industry de-



Duluth supports a large shipping industry.

Minnesota residents spend many leisure hours on skis.

clined. The best forest land had been depleted and the need for future planning and conservation was soon apparent.

Another great industry in Minnesota centered around the production of wheat and flour. During the 1850's, mills began to spring up along waterways, and from the beginning, the high quality of Minnesota flour was recognized. The invention of new farm equipment made possible the development of bonanza wheat farms, and grain elevators were devised to meet the needs for storage.

By 1870, there were 12 mills operating at St. Anthony Falls, and it was not long before Minneapolis became known as the capital of a rich flour-producing region.

Late 19th and Early 20th Centuries

The 1870's, were marked by a rapid expansion of the railroad which further opened the prairies to settlement. Sod houses and dugouts were replaced by frame houses built with lumber from a growing industry.

Though industrial expansion was the keynote of the 1870's, the North Star State experienced a series of disasters. In 1873, there was a blizzard; the same year there was a national depression. Duluth was hit particularly hard by the depression since the city was wholly dependent on Jay Cooke's promise to make it the lake terminus of a proposed transcontinental railroad. Three years later a grasshopper plague invaded 29 counties, destroying crops and even attacking clothing and wood. Private donations and legislative appropriations were necessary to keep thousands of prairie residents from starving.

During this period, farmers complained of excessive rates of the railroads and of agents grading grain improperly. They expressed their displeasure through the Grange. In 1869, 40 of the 49 Granges of the Nation were located in Minnesota. A series of Granger Acts benefiting the farmer were enacted, and by 1874, Grangers controlled the State legislature. However, with a change of attitude on the part of the railroads, Grange influence waned.

The Vermilion and Mesabi Ranges were first developed in the 1880's and 1890's. Suddenly, Minnesota became one of the richest iron-producing regions in the world. In 1911, the first shipment was made from the Cuyuna Range and by the end of the second decade of the 20th century, Minnesota was leading all the States in the value of iron ore produced and was supplying seven-tenths of the Nation's output.

Minnesota Today

The North Star State continues to be an area of growth and change. Today, the electronics industry is flourishing in the St. Paul-Minneapolis area. The Tyrone Guthrie Theatre, though relatively new, is a nationally known center for the arts. The Mayo Clinic in Rochester is world renowned, and the University of Minnesota is one of the largest and one of the most respected of the land-grant colleges.

Growth and change are welcomed in Minnesota, but industrial growth and population change must be planned for. Rivers and streams must be protected from pollution; areas like the Boundary Waters Canoe Area must be maintained; forests and lands must be used wisely so that they can support future use. Today, the people of Minnesota are planning for the future.

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Physical Characteristics

Minnesota serves as the northern gateway to the West. Occupying the Lake Superior highlands, it lies in a portion of the prairie plains and forms the very apex of the Mississippi Valley. It is the 12th largest State in the country.

The North Star State is almost wholly surrounded by water. By international agreement, the northern boundary with Canada follows natural waterways—the Border Lakes, Rainy River, and the Pigeon River—to the most northwesterly point of Lake of the Woods. From there, the northern boundary extends to 49°23′50.28″ north latitude, the northernmost point of the conterminous United States. Lake Superior lines the northeastern section of the State. The St. Louis, St. Croix, and Mississippi Rivers form most of the eastern boundary with Wisconsin; and the Red River of the north and Big Stone and Traverse Lakes separate Minnesota on the west from North and South Dakota.

Topography

More than two-thirds of Minnesota is nearly flat or gently rolling ground that lies between 1,000 and 1,500 feet above sea level. The topography of the State, though without great relief, presents considerable variety of feature.

Both the lowest and highest points are in the northeastern part which is sometimes called Arrowhead Country because of its shape. The highest point is the top of Eagle Mountain in Cook County, 2,301 feet above sea level; the lowest is the surface of Lake Superior, 602 feet above sea level. The rugged Sawtooth Range lies between, marked by bedrock ridges which rise precipitously. In the western part of Arrowhead Country are the Misquah Hills and Giant's Range, a granite ridge rising 50 to 500 feet above the general level of the region. South of Giant's Range is a belt of famous iron-bearing rocks—the Mesabi Range.

The northwest and west are lands of flat prairies that merge gradually with the hills of the northeastern forested areas. In the southeast, the gently rolling lands are marked by incised streams and cross-cutting valleys.

Lakes and Rivers

Minnesota's lakes are most striking; they vary greatly. The rock-ribbed lakes of the northeast are buried in a wilderness of pine forest making a labyrinth of streams and lakes. Sunlit shallow lakes in the central part of the State are set in deciduous forest. Lake Superior bounds Minnesota's northeast margin and is part of a waterway to the Atlantic Ocean via the other Great Lakes and the St. Lawrence Seaway.

The headwaters of the Mississippi River are in north-central Minnesota at Lake Itasca, about 200 miles northwest of Minneapolis and St. Paul. The Mississippi begins as a small stream flowing out of the lake at an elevation of 1,475 feet and winding in and out of small reservoir lakes. South of St. Cloud the river widens, but the channel is relatively narrow to St. Anthony Falls in Minneapolis.

The river is dammed and diverted at the falls to produce hydroelectric power. In the days of river steamers, these falls marked the end of the route. Just south of the Twin Cities, below the confluence of the Minnesota and Mississippi Rivers, the valley of the Mississippi is broad and beautiful, a mile or two wide with steep walls that rise 400 feet or more

above the flood plain. Below Red Wing, the river broadens over its flood plain to form Lake Pepin behind a natural dam.

Geologic Sketch

The rocks and landscape of Minnesota bear silent witness to events that took place over a span of at least 3 billion years.

The story told by the rocks begins when the northern part of the State was covered by a great arm of an ocean. Clay, mud, and sand accumulated in this sea, accompanied by great outpourings of lava. Weathering of the lava flows (and other rocks) yielded iron, silica, and carbonate which precipitated in relatively shallow water to form the source rock for the iron deposits of the Vermilion Range.

Folding and deformation of these rocks ensued, granitic masses were intruded deep within the earth and further deposition of muds and sands took place in the warped basin. Finally, a great mountain range was formed.

A very long period of erosion followed. The mountain range was slowly eroded until its completely deformed roots were laid bare on a gentle plain; rocks exposed at the surface had been buried as deep as 10 miles below. A new shallow sea spread across the roots of the mountains. Sands were deposited along the shoreline, and in deeper water, silica, iron, and carbonate were precipitated to form the iron formations of the Mesabi and Gunflint Iron Ranges. Algal structures preserved in these rocks are one of the oldest indications of life on this planet.

Subsequently, the relative level of the land and sea changed and great quantities of clayey mud were brought in, burying the iron formation. A new period of mountain building followed, baking and changing the rock, and forming gneiss and schist which have been dated 1.7 billion years old. Again, erosion gradually and inexorably lowered the mountains.

Gigantic crustal upheaval in a zone slanting southwestward from the Lake Superior Basin brought fissuring of the earth and lava poured out into a great trough. Lava flows accumulated, perhaps as much as 30,000 feet locally, and masses of molten rock forced their way between the flows. A huge mass pushed in at the base of the flows now stretches from Duluth 125 miles to the north. Named the Duluth Gabbro, it is one of the largest intrusions of gabbro in the world. An extensive zone of copper-nickel sulfide minerals within the gabbro contains large potential resources and is the basis for a new industry which is being developed.

For the past one-half billion years, Minnesota has been part of a broad relatively stable region. Slight, but widespread changes in relative levels of land and water are marked by the rocks formed from sediments in each of the numerous marine invasions. Sands were deposited along the shifting shorelines and mud or limestone in slightly deeper water. However, for much of this time, the area was above the sea, a low-lying stable land.

About 100 million years ago, the seas again inundated the State. A great variety of deposits were left behind as a result of the long period of prior erosion and the submergence of areas not previously covered by water. These deposits constitute the most recent rock layers to be found in the State; above them lie the unconsolidated materials left behind by glaciers in the Ice Age.

The glaciers and rivers of the Ice Age shaped the major features of the landscape of Minnesota as we know it today. At one time the southern part of the Great Canadian ice cap covered the State completely, but for much of the glacial period the restless margin of the glacier lay somewhere in the State. As the ice advanced from the polar region towards the margin of the ice field, it scraped up and moved great volumes of material. This debris—rock, soil, and vegetation—was deposited near the margins of the ice sheets in terminal moraines or was dumped during melting to form drift-covered areas of ground moraine. The melt water from the glaciers carved wide valleys and carried great quantities of rock debris that were redeposited as outwash. Lobes of ice advanced and melted at least four times, until a final general period of melting ended the glacial age about 10,000 years ago.

The topography of Minnesota today is substantially the same as at the end of the Ice Age. The bedrock areas of northeastern Minnesota were scraped bare by the moving ice and only partly covered by ground moraine and lake deposits during the period of retreat. The basin of Lake Superior was deepened by the ice and a broad valley carved to the south by melt water. The Minnesota Valley

and the Mississippi Valley below St. Paul were carved by a gigantic river, far larger than the present Mississippi, which was fed by the melting ice.

The lakes of Minnesota were formed in a variety of ways, but most are glacial in origin. Some occupy depressions scooped out of solid rock by the moving ice. Many others were formed where uneven deposition of morainal debris left hollows where water could collect. Morainal ridges dammed other lakes, such as the large and beautiful Mille Lacs Lake. Small rounded lakes were formed in moraines where the melting of ice blocks trapped in debris made depressions.

Due to poor drainage in ground moraine, lakes in which sediments and plant life accumulated became swamps. Now thousands of square miles in the northern part of the State are overgrown by the thickly tangled vegetation of the muskeg country.

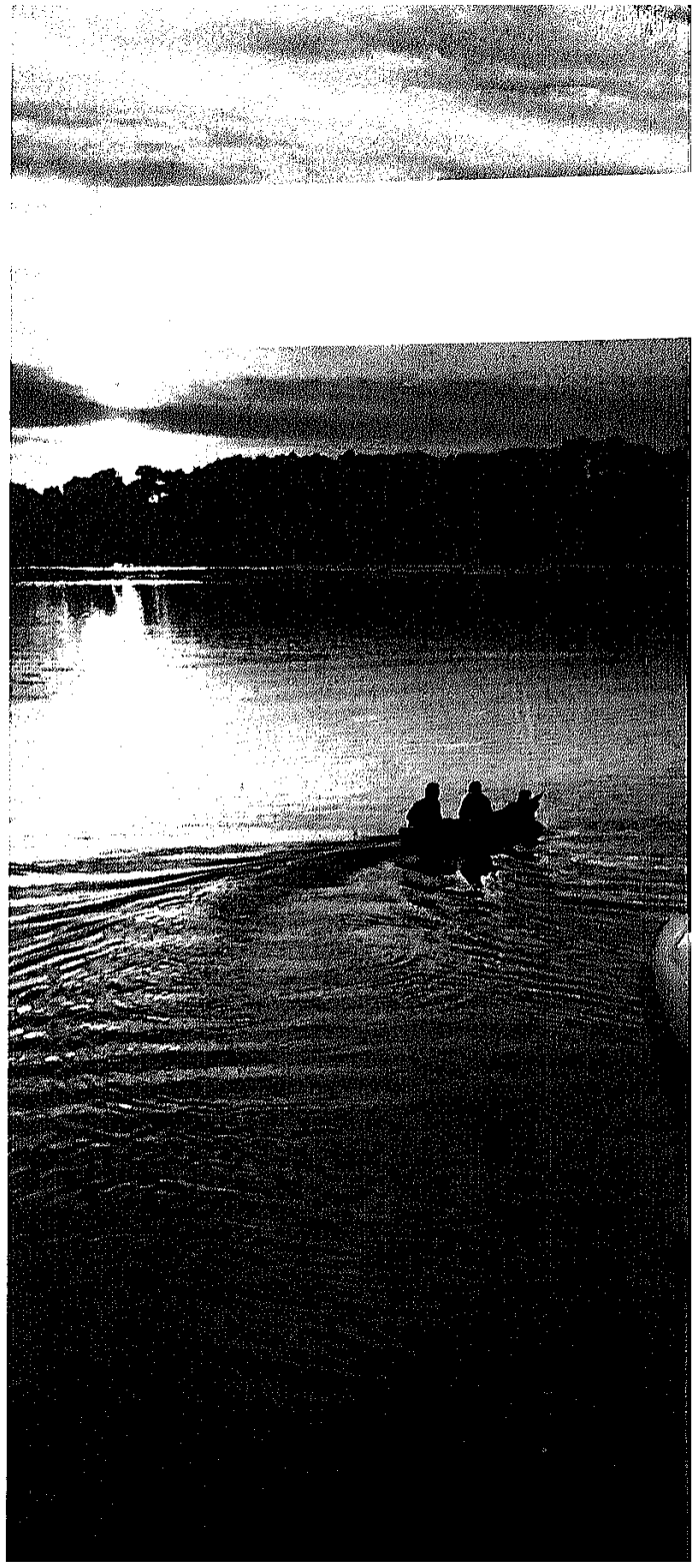
The fertility of the farms of the State is in great part due to glacial processes. The layer of drift left behind contains nutrients and soluble minerals required for plant growth. Glaciers also flattened the land, lowering hills and filling depressions, producing more and better farm land.

Climate

Minnesota's climate is marked by the contrasts of a continental interior—an area which lacks the tempering effects of nearby oceans. The average mean temperature varies greatly from season to season. It is 14°F. in winter; 42°F. in spring; 68°F. in summer; and 46°F. in the fall. Although temperatures may get quite high in the summer, the humidity is usually low during the day.

The average annual precipitation is greatest in the extreme southeastern counties, 32 inches, and diminishes in a northwesterly direction across the State to 19 inches in the lower valley of the Red River of the North.

The length of the growing season, like the temperature, varies greatly. In the north, it is short—90 to 100 days. But, throughout central and southern Minnesota, the growing season is from 130 to 170 days.



"Land of 10,000 lakes" is more than just a motto for Minnesota. Lakes provide scenic and recreation areas which are used by visitors and residents year-round.

Indian Heritage

Since the beginning of the 18th century, Minnesota has been occupied by segments of two of the most celebrated of Indian tribes, the Sioux (or Dakota) and the Chippewa (or Ojibway).

The Sioux were members of the Siouan linguistic family, a group scattered widely north of Mexico that included such tribes as the Omaha, Winnebago, Iowa, Oto, and Mandan.

An aggressive and martial tribe, their bravery has never been questioned. They conquered or drove out every rival tribe except the Chippewa.

Unlike the Prairie Sioux further to the southwest, the Minnesota Sioux were forest dwellers. Their economy was based on hunting, fishing, and some agricultural pursuits. They had large permanent villages and were less warlike than the neighboring Plains Sioux.

The Sioux wore deerskin shirts and leggings, leather moccasins, and elaborate headdresses. They rode and hunted on horseback and lived in wigwams covered with skins.

During the 17th century, the tribe was dominant in Minnesota until the Chippewa migrated westward along the shores of Lake Superior to northern Minnesota. Thus began a great rivalry between the tribes.

The Chippewa are members of the Algonquian language group. Their original home is believed to have been around the Sault Ste. Marie, but they are now found as far west as Montana, and in Canada as well as the United States.

Europeans made early contact with the Chippewa, who were party to the extensive North American fur trade. In the 16th and 17th centuries, the Chippewa moved westward to the Lake Superior region due to pressure of European settlement. Although strong in numbers and occupying an extensive territory, their remoteness and isolation from the frontier precluded their playing a significant historical role in the early days of the United States.

The aboriginal Chippewa were adept in woodcraft and steeped in the lore of forest ways. They tended to remain fairly close to the Great Lakes and tributary waterways. It was the Chippewa who inspired Longfellow's "Hiawatha," although the poet named his hero for an Iroquois Indian.

Indian Wars

In Minnesota, the Chippewa triumphed over the Sioux. Acting as advance agents for the French fur traders who equipped them with firearms, the Chippewa began moving down from Lake Superior during the 17th century, driving the Sioux southward. When Du Luth, the French explorer, arrived at a Sioux village at Mille Lacs in 1679 and planted the King's flag, the Chippewa were claiming all of the hunting grounds to the north and east.

Chippewa-Sioux enmity persisted through the years of succeeding French, British, and American control of the region, ending only after most of the Santee Sioux were forced from Minnesota into the Dakotas following an uprising in 1862.

The Sioux in Minnesota found the Civil War both a cause and an occasion for rebellion. They felt cheated in the distribution of food which, due to the war, was in short supply everywhere. Moreover, they knew that most of the regular U.S. troops were engaged in combat hundreds of miles away and that the settlers' families were unprotected.

When, in August 1862, a minor shooting affray

About 10,000 Indians reside on seven reservations and in about a half dozen "Indian communities" in Minnesota.

excited the Santee Sioux living along the Minnesota River, about 1,500 warriors decided to take the warpath under Chief Little Crow. After killing many settlers at the Lower Sioux Agency near Redwood Falls, they swept across Minnesota slaughtering the families of the newly arrived. Federal troops closed in on Little Crow and his warriors following the killing or wounding of hundreds in an attack on Fort Ridgely and the German settlement of New Ulm.

Leech Lake in northern Minnesota is the site of one of the last Indian disturbances, a Chippewa uprising occurring in 1898. The minor clash was attributed to an attempt by a U.S. marshal to arrest some Indians involved in illegal whiskey selling on the reservation.

Indian Life Today

There are approximately 10,000 Indians now residing on seven reservations and in about a half dozen "Indian communities" in Minnesota. The largest group is the Chippewa, but there are also about 350 Sioux. Another 6,000 to 8,000 Indians reside off reservations and outside "Indian communities."

The education of Indian children living on nontaxable Federal or Indian lands has been the responsibility of the State since 1936–37. In 1966–67, 1,521 of these children were enrolled in public schools while two elementary parochial schools enrolled approximately 300 students.

Interest in completing high school has gradually increased among these children, and, of the over 190 Indian high school graduates each year, two-thirds to three-fourths go on to programs of higher education. About 25 to 30 percent go to college and another 40 to 60 percent take vocational training.

The harvesting of timber is an important source of income and employment on Indian lands. Of the 734,800 acres of land in Minnesota under Indian ownership, 502,000 acres are classified as commercial forest land, containing an estimated 1.8 billion board feet of timber. All of this land has been logged over in previous years and is now being managed as second growth forest.

The cut of timber and the income from it vary somewhat each year depending upon economic conditions in the industry. In a recent year, more than 29.9 million board feet of assorted forest product materials, valued at more than $224,000, were sold from Indian forests within the State.

Mineral development consists almost entirely of sand and gravel operations, with the largest gravel deposits on the Grand Portage Reservation. There are no known or suspected oil and gas deposits on reservation lands. During the fiscal year ending June 30, 1967, minerals mined on Minnesota reservations produced an income of about $7,000 for the Indians with an additional $46,656 from surface leasing. A recent mineral study of several reservations uncovered an iron deposit believed to be of commercial proportions. The find is small when compared to other deposits in Minnesota and developmental interest has not been particularly satisfying.

The harvesting of wild rice adds materially to the annual income of many Indian families in Minnesota. This delicacy is highly prized by Indians and non-Indians alike and always finds an excellent market.

Land and Forests

Fur trading, lumbering, and land speculation captured the imagination of men who came to Minnesota before the middle of the 19th century. But, it was not until the 1850's that agriculture took on importance as a means of earning a living. Then, for several decades, wheat farming boomed.

When agriculture first began to grow in Minnesota, the rich prairies were ignored and farmers chose to cultivate the wooded valleys and hills along the Mississippi, St. Croix, and Minnesota Rivers. Though clearing this land was a difficult process, the farmers were wary of cultivating the prairies where water could be obtained only by digging deep wells; where there were few trees; and where crops and homesteads were threatened by cyclones and prairie fires. But, eventually, the farmer followed the railroad across the State and into the prairies.

For many years, wheat farming flourished and bonanza farms averaging 2,000 acres were created. During the period from 1880 to 1890, the livestock industry grew and dairying gained new importance. Corn production increased also.

Although since 1950 the value of manufactured products has consistently exceeded Minnesota's cash farm income, farming remains a vital source of income.

The number of farms in Minnesota has been decreasing while the size of farms has increased somewhat. This is in line with a national trend. In a recent year, there were 144,000 farms covering 32,400,000 acres. The average size farm was 225 acres.

Minnesota is one of the great dairy States. It ranks second only to Wisconsin in milk production. Livestock and livestock products provide the greatest income to farmers and grains are also a great source of income. Poultry production is important, with Minnesota ranking second in the number of turkeys raised.

Important crops include wheat, corn, soybeans, hay, oats, flaxseed, green peas, and sweet clover seed.

Forest Resources

Nearly 62 percent of Minnesota's total area was

(Far left) Strips of corn and hay border Oak Lake. (Center) Smokey the Bear warns that carelessness can lead to forest fires. (Right) This pulpwood "raft," when completed, will be towed to Ashland, Wis. The wood will then be transported by rail to a paper mill.

forested when Europeans first came. But, early lumberers exploited the land, moving on when the virgin forests had been depleted. They were not concerned with conservation and saw no reason for the abundant forests to be protected.

The original forests were chiefly two types: (1) hardwood forests, extending from the mouth of the Crow Wing River south to the State boundary; and (2) the North Woods—or evergreen forests—of pine, spruce, tamarack, balsam, cedar, and a few scattered hardwoods.

Cutting of the original stands, land clearing for agriculture and towns, and repeated fires have been responsible for many changes in the forest picture. Now, hardwood forests are found mainly in scattered farm woodlots, but the North Woods is still a large, unbroken forest area. Nearly a third of the commercial forest area supports stands of aspen, whereas in the original forest, aspen was found only in woodland borders and in small openings.

Today, the forest area is slowly expanding as abandoned farmland is allowed to revert to forest and as forest industries, private landowners, and the State and Federal governments plant new trees on denuded and burned lands. The potential wealth of Minnesota's forests is immense and, unlike the mineral wealth, can be increased and renewed through proper use.

Federal, State, and county governments own 56 percent of the commercial forest in Minnesota, with State and counties owning 39 percent and the Federal Government, 17 percent.

The annual harvest of forest products brings the State an income of over $300 million. Industries using forest products as their basic raw materials now rank third in economic importance in the State, surpassed only by mining and agriculture.

In addition, forests provide the setting for the recreation and tourist industries that bring in millions of dollars.

In every category except number of people employed (volume, value of raw products, value of finished products, etc.), the pulp and paper industry is the largest of Minnesota's forest-based industries. Minnesota ranks 14th among the States in wood pulp production.

More than 12,000 sawmills (most are small establishments) are active in Minnesota producing between 175 and 200 million board feet of lumber annually. The lumber industry provides 9,400 full-time jobs each year.

Fuelwood, the principle forest product a few years ago, now ranks fifth in value.

In addition to wood fiber, trees yield other commercial products including nuts, fruit, maple syrup, and cones. Christmas trees and wreaths are also important.

Tree Farms

A tree farm is a privately owned forest area that has been dedicated by its owner to the continuing production of forest crops and is protected and managed with that end in mind. As of January 1967, over 1,697 landowners had enrolled their holdings of more than 790,718 acres in the American Tree Farm System. Thus, future production is assured on many acres of land.

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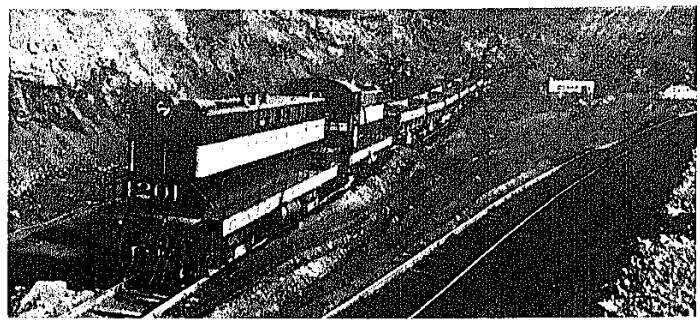


(Left) An electric shovel loads iron ore from the Mesabi Range into railway cars. (Right) A craftsman carves granite at a sawing and finishing plant.

Mineral Resources

Minnesota stands about 12th in the Nation in the annual value of its mineral products, with a yearly production of over $500 million. Production of iron ore dominates the State's mineral economy and represents about 60 percent of the usable ore produced by mines in the United States; manganese is derived from iron ores of the Cuyuna district. Industries have built up around the quarrying and processing of granite, dolomite, and limestone for building and monumental stone. Gravel and sand are excavated and clay deposits supply the ceramic and lightweight-aggregate industries. Marl and peat, produced in several Minnesota counties, are used for agricultural purposes. Development of the large but low-grade resources of copper and nickel are under intensive investigation.

Iron Ore

Since the first load of iron ore was shipped from Minnesota in 1884, more than a billion gross tons of first class ore have been mined in the State. About 50 million tons a year of iron ore and iron concentrates, representing more than twice that weight in raw lean ore blasted and shoveled from the iron ranges, comes out of Minnesota and feeds the blast furnaces of the Nation's steel plants.

Rich, reddish hematite and browner magnetite ores were discovered in 1865 in the vertical deposits of the Vermilion Iron Range in St. Louis County. A quarter of a century later the Merritt brothers (known as the "Seven Iron Men") and others opened up massive horizontal beds of the much larger Mesabi Range, the Indians' "hidden giant," that extended west through St. Louis County and Itasca County. Still later, in 1911, iron ore enriched with manganese was discovered in the Cuyuna Range of nearby Crow Wing County.

Through World War I, the Mesabi and the other ranges produced ores of almost incredible richness, almost pure iron oxide. Shipped directly to blast furnaces, their low cost and high quality enabled the American steel industry to rise to world leadership. But the supply could not last forever. Eventually, the leaner and mixed ores disregarded in the beginning were the only ores available. The steel mills had to make technical improvements in blast furnace operation to accommodate the gradually lowering iron content.

By the late 1930's, blends averaging about 50 percent iron were considered usable as mined. By the beginning of World War II, it was necessary to beneficiate, or improve, in some manner nearly half of all the ore mined. War placed even heavier demands on Minnesota's vast iron resources. As much as 75 million tons went into the war effort in a single year and the pace of depletion quickened.

At the close of the war, a typical "50-percent" blend would be prepared by mixing lean raw ore with ore that had already been beneficiated to a 60 percent iron content. Today, nearly 85 percent of all ore mined must be beneficiated and the average iron content as shipped to the steel mills has risen above 57 percent.

Taconite Iron Ores

Alongside the familiar ores in the iron ranges—but incredibly greater in extent—are vast deposits of a hard iron-bearing rock called taconite. Although this rock is much more difficult to mine and to crush than the soft hematite and magnetite, methods of magnetic separation have been perfected that now make taconite ores of steadily increasing importance.

This trend was accelerated when the citizens of Minnesota approved, by popular vote in 1964, tax concessions that encouraged construction of several hundred million dollars worth of giant taconite beneficiation plants.

Only the magnetic iron minerals in taconite can be economically processed at this time, but research in reclaiming the nonmagnetic portions and in beneficiating wholly nonmagnetic taconites is progressing steadily. This ultimately should mean a substantial increase in Minnesota's usable iron reserves.

Manganiferous Ores

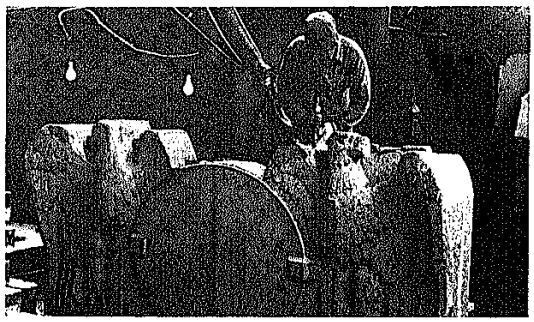
Manganese—valuable ingredient in steelmaking for over a century—is present in much of the iron ore found in the Cuyuna Range. Statistics on the production of manganiferous ore—with a manganese content recently averaging about 12 percent and an iron content of better than 33 percent—show that about 300 thousand tons are shipped annually. Much of the iron ore from the Cuyuna Range, containing less than 5 percent manganese, is sold at a premium because of the manganese content. Research is now being conducted to improve beneficiating techniques for vast masses of leaner Cuyuna ores that cannot now be mined economically.

Copper and Nickel Ores

The presence of copper and nickel sulfides in a part of the Duluth Gabbro has long been known, but the grade of less than 1 percent combined metal is so low that economic development has had to wait until metal prices and mining technology improved. Commercial development of this resource is under intensive study within a 4,894-acre mining lease in the Superior National Forest. When production is initiated, byproduct recovery of platinum metals will also be possible.

Nonmetals

Sand and gravel, produced in all Minnesota counties, meet local demands for building and road construction. A large plant at Duluth makes both portland and masonry cements. Clays—mined in six counties in various parts of the State—are processed into lightweight aggregate for concrete, brick,



vitrified sewer pipe, floor and wall tile, and other heavy ceramic products. The State's only light ceramics plant, located in Red Wing, produces dinnerware and art pottery chiefly from materials imported from other States. It is believed that clays from near Cook, in St. Louis County, eventually may be found suitable as a raw material.

Gemstones, principally semiprecious agates, are found along the north shore of Lake Superior. Abrasive stone is produced from a quartzite deposit near Jasper in Rock County.

Nearly $12 million worth of limestone and granite is quarried in more than a score of counties. The granite is produced chiefly for architectural and monumental uses. Broken granite is sold for railroad ballast, concrete aggregate, roadstone, riprap, and stone sand. Most of the limestone is quarried for use as concrete aggregate or roadstone. Other major uses are as cut stone for buildings, as rough stone and rubble, for various agricultural purposes, and as house stone veneer.

Sulfur is recovered from petroleum at an oil refinery at Pine Bend in Dakota County. Perlite and vermiculite are imported from other States and expanded at plants in Minneapolis and St. Paul for use as lightweight aggregate in concrete products.

Mineral Fuels

Minnesota's only known mineral fuel reserve is an estimated 7 billion tons of peat. It is not now used for fuel, but is dug in Aitkin, Carlton, Itasca, Otter Tail, Pine, and St. Louis Counties, near the iron ranges, for use as a soil conditioner and for other agricultural or horticultural purposes. Moss peat is the most popular but reedsedge and humus also are sold. More than 11,000 tons, valued at $200,000, are produced in a typical year.

Minnesota's small oil refining industry processes petroleum brought in from other States and from Canada.

Water and Power

The power of water is seen at High Falls on the Pigeon River. The availability of water power encouraged the growth of the lumber and flour industries.

Minnesota, "land of 10,000 lakes," has at least 15,292 lakes more than 10 acres in area. Moreover, five are listed among the 16 largest inland fresh water lakes in the United States. The large number of lakes in picturesque settings enhanced by the relatively cool summer climate, makes the State particularly attractive to summer visitors.

Three of the four major divides which distribute the runoff from the United States go through Minnesota. The Mississippi River and its two principal tributaries in Minnesota, the St. Croix and the Minnesota Rivers, drain approximately two-thirds of the State to the Gulf of Mexico. In the northeast, the St. Louis River and other Lake Superior tributaries, including the Pigeon River on the Canadian border, drain to the St. Lawrence River. The Rainy River on the Canadian border and the Red River of the North system along the western horder drain to Hudson Bay. Thus, except for some minor tributaries, all of the surface flow goes out of the State.

Water Availability

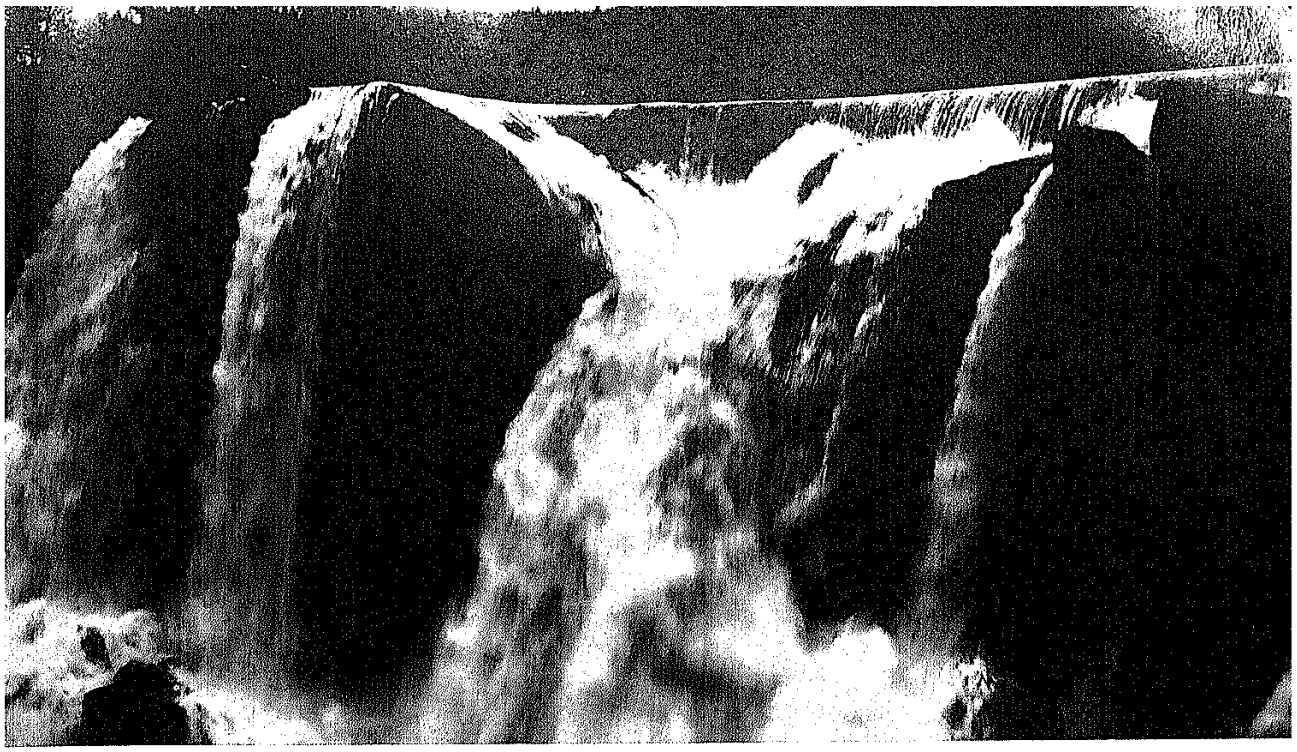
The average total runoff of surface water in Minnesota ranges from less than an inch in the extreme western part of the State to more than 10 inches in the northeastern part. The average is about 5 inches, but, during long periods of below average precipitation, the annual runoff is much less. Furthermore, much of Minnesota's runoff enters lakes where it is lost by evaporation from the lake surface. Because most of the State has only slight relief, good reservoir sites are few and it is not practical to store a significant part of the runoff in reservoirs.

There are numerous water-bearing rocks in the central and southeastern part of Minnesota, however, the northwestern and southwestern areas generally have only isolated water-bearing units. Accordingly, in much of the State there is a foreseeable limit on the availability of low-cost water for municipal and industrial use.

In general, surface-water supplies are adequate along the main stem of the major rivers and groundwater supplies are adequate throughout the central and southeastern part of the State. Management of water supplies through storage in ground-water reservoirs probably will be of increasing importance; in some areas, future supplies will he piped considerable distances to towns, but water resource studies indicate that adequate supplies can be found.

Ground Water

Despite the abundance of lakes and streams, ground-water use almost equals surface-water use in



Minnesota. The State relies heavily on ground water for municipal and industrial supplies, and nearly all water for rural domestic use is obtained from wells. But, large cities, such as Minneapolis, St. Paul, Duluth, and St. Cloud obtain municipal supplies from surface water.

Industrial use of ground water is important throughout Minnesota, but especially in the Twin Cities area where many industries utilize artesian wells that tap the deep, ancient sandstones. Throughout southeastern Minnesota, water-yielding sandstones lie like stacked saucers under the land's surface. The bottom sandstone, lying more than 1,000 feet below the land's surface at St. Paul, provides high quality water for many municipal and industrial wells. Five hundred feet above this is another major sandstone aquifer that supplies water used for air conditioning as well as industrial and municipal purposes. These two units provide large wells in the area with abundant water at low cost. Smaller supplies can be obtained from sandstones at depths of 200 to 300 feet and from shallow wells in glacial drift.

The entire north-central part of the State is underlain by thick permeable glacial deposits and in most areas shallow wells supply abundant water of good quality. Along the Lake Superior shore, however, only small amounts of ground water can be obtained, largely from fractured bedrock. Glacial deposits are thin or absent and most deep wells yield saline water.

Irrigation

Although precipitation in agricultural areas has usually been sufficient, there have been periods of deficiency, and the desire for higher cash crops has each year made more farmers turn to irrigation as a means of supplementing rainfall. Surface and ground water are both utilized for irrigation.

Although irrigation in the State is still in its infancy, permits have been issued for use in 68 of Minnesota's 87 counties. It is certain that there will be a continuing increase in the use of supplemental irrigation on Minnesota's rich farmlands.

Water for Ore

In 1960, it was estimated that Minnesota had at least 4 billion tons of taconite-type iron ore suitable for concentrating into commercial blast-furnace feed. However, to produce 1 ton of finished taconite pellets, 10,000 gallons of water are needed and almost 10 percent of this is consumed—that is, cannot be recirculated. Streams and lakes, including Lake Superior, are being used to supply this water.

Additional surface water sources will be tapped as development continues, hut ground water will be called upon increasingly in order to meet expected future demands.

Water Pollution

If Minnesota is to maintain its reputation as a major water recreation area, its water quality standards must reflect that objective and those standards must be rigidly enforced. Fortunately, the State has widespread public support for water pollution control from well-organized civic, conservation, and women's groups; Minnesota's recently revised water pollution law is expected to accelerate pollution abatement through the late 1960's and to maintain good water quality management thereafter.

Construction of local sewage treatment plants, one

A small stream about a dozen feet wide and six inches deep is the source of the mighty Mississippi River.

indicator of the extent of municipal pollution control, has maintained a lively pace in Minnesota in recent years. But this does not tell the whole story. While 99 percent of the State's population served by sewers has some type of sewage treatment, 140 Minnesota communities have inadequate or no treatment facilities for populations totaling 666,000. About one-third of these communities are in need of sewage collecting systems as well. Most of the pollution from these areas is concentrated in a few major rivers which have been used traditionally to carry off effluent. With increasing populations, the capacity of the rivers to dilute the effluent is greatly reduced.

In the Twin Cities metropolitan area, as well as some other communities, there has been local groundwater pollution from extensive use of septic tank disposal systems too closely spaced in some of the very sandy soils which are typical of much of Minnesota. Moreover, in many of these areas, suburban homes depend on individual water wells for water supply.

Industrial as well as municipal waste sources and the extent of their treatment needs have been documented for each of Minnesota's interstate basins. Many industries can economically connect to municipal treatment systems for disposal of their wastes, but some industries with wastes that are not amenable to conventional treatment, must install their own systems or step up present control practices to meet water quality requirements of the receiving streams.

Industry, for the most part, has been quite cooperative with the State water pollution control agencies. But some problems stem from older industrial activities, such as iron ore mining, metal and food processing, forest products manufacture, tanneries, and stockyards. Newer problems relate to petroleum processing, chemical manufacturing, electronics and agricultural use of pesticides among other things. Thermal pollution has occurred in some streams from electric powerplant wastewater returns.

Currently, dissolved oxygen deficiencies, high bacterial levels and excessive nutrients exist in many of the lake and stream waters of the Upper Mississippi Basin, making them unsuitable for recreation or for fish and wildlife habitat.

Although much remains to be done, the State has made significant gains in water pollution control in the last few years.

Upper Mississippi Study

Minnesota is one of seven States participating in a joint effort with the Federal Government to assure the best use of water and related land resources to satisfy all foreseeable short- and long-term human needs in the Upper Mississippi River Basin. Preparation of a general plan of development, the basic objective of the Upper Mississippi River Comprehensive Basin study, will provide a guide whereby more detailed subbasin and project plans can be prepared.

The study involves an area of more than 189,000 square miles in 302 counties and seven States. Nine basic areas of investigation have been emphasized: Public and industrial water supply, navigation, recreation, flood control, water pollution control, soil

d water conservation, fish and wildlife conservation, and hydroelectric power.

Federal agencies involved in this investigation are: Department of Agriculture, Department of the Army, Department of Commerce, Department of Health, Education, and Welfare, Department of the Interior, and the Federal Power Commission. Those States participating include Illinois, Indiana, Iowa, Missouri, South Dakota, and Wisconsin, as well as Minnesota.

Power Production

The total powerplant generating capacity installed in Minnesota as of the end of 1966 was over 3½ million kilowatts. Hydroelectric powerplant capacity amounted to 5.1 percent of this figure and 94.9 percent was from thermal powerplants. There are no nuclear powerplants in the State.

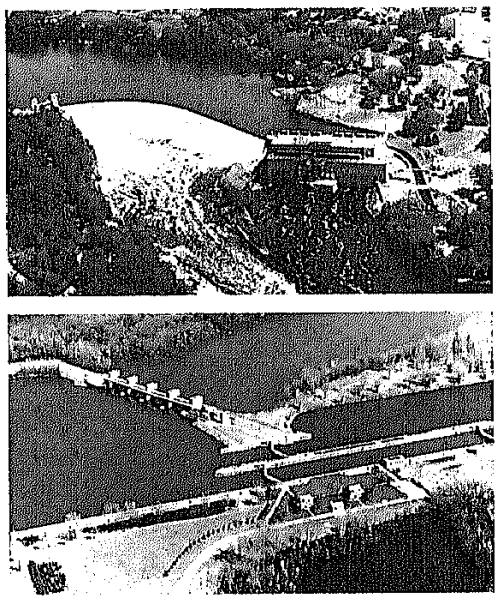
During 1966, a total of over 17 billion kilowatthours was produced in Minnesota. Hydroelectric powerplants produced 6.9 percent of this and thermal powerplants produced 93.1 percent.

Though there are many bodies of water in Minnesota, few river areas are sufficiently canyon-walled for dam and powerplant construction. But, studies by power specialists do show that the hydro potential remaining undeveloped on Minnesota's rivers is nearly as much as that developed. However, low-cost transportation of fuel by way of the Mississippi River and the Great Lakes has made the construction of steam plants more attractive than hydroelectric construction.

Plans for Power Development

Minnesota is taking part in several major plans for power development which involve the generation, transmission, and exchange of electric power among various organizations in the utility business. The first regional power pool of the Missouri River Basin was formed January 31, 1963, when representatives of 105 consumer-owned electric utilities from seven States signed a pooling agreement formally organizing the Missouri Basin Systems Group. By 1966, the membership of this pool had increased from 105 to 120 and included 18 members from Minnesota. This group agreed to make use of a Bureau of Reclamation transmission system which extends into the western part of Minnesota.

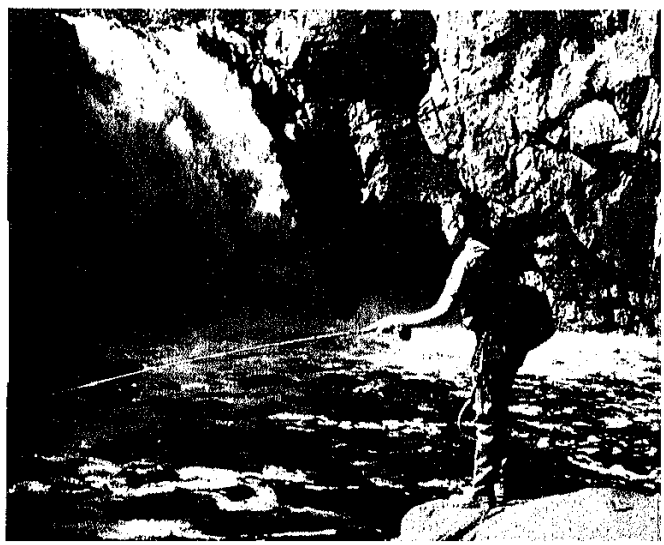
The Mid-Continent Area Power Planners (MAPP), also formed in 1963, with a membership of 22 local power suppliers operating in 10 States, now includes 39 power suppliers—six generation and transmission rural electric cooperatives, 14 investor-owned electric companies, 17 municipal electric cooperatives, a public power district, and the Manitoba Hydro-Electric Board. By 1980, the members of this pool will require an additional 18 million kilowatts of new baseload generating capacity. This includes 620,000 kilowatts of nuclear capacity for the Twin Cities area. Plans envision the addition of 11 new stations in the United States and Canada and support for high voltage transmission lines between Winnipeg (in the province of Manitoba) and the Twin Cities area and other areas.



Small water development projects do a big job. (Top) A dam produces hydroelectric power. (Bottom) This dam is insurance against damaging floods.

Through these and other power pools, lower cost electric power results from: less total installed capacity, reduced reserve requirements, larger generating units at lower installed costs, lower transmission capital investments because of jointly planned systems avoiding duplication, and reduction in fuel cost by exchange of economical energy.

(Top) White-tailed deer stand at attention. (Bottom left) The moose, which was almost decimated, has rebuilt its numbers slowly. (Bottom right) A trout fisherman waits for a tug on his line.



Fish and Wildlife

With the coming of settlers, the conifer forests of the north and northeast and the hardwood forests of the central and southeast felt the bite of loggers' axes; the rolling grasslands of west and southwest Minnesota were broken by the farmer's plows. These new land uses soon eliminated several of the larger native mammals—the grizzly bear, carihou, pronghorn antelope, bison, and elk.

The moose, which was almost decimated, has rebuilt its numbers slowly. The cougar is seen occasionally and the black bear still thrives. Just prior to World War I, 56 elk were imported from Wyoming and released in northern Minnesota. This herd grew to nearly 300 animals but then almost disappeared. White-tailed deer made a remarkable comeback in Minnesota during the first half of the century.

Furbearers, such as the beaver and fisher, also have made comebacks, but the Canada lynx is relatively scarce and the pine marten has almost vanished from the State.

With more than 1.5 million anglers and a half million hunters presently enjoying the out-of-doors in Minnesota and contributing nearly $150 million a year to the economy, Minnesota is facing serious conservation challenges in continuing to provide for this ever-growing population.

Big Game

White-tailed deer are found primarily in that brushy zone where prairie meets forest. Logging and forest fires, following settlement, opened up the forest stands and encouraged the growth of forest shrubs, greatly increasing the food supply for deer. In the 1930's, the State's deer herd hit a peak population level of nearly a half million. This number has since levelled off to about 400,000 with a quarter million deer hunters taking 100,000 or more deer each fall.

In fact, deer are so thick in parts of Minnesota that all the cedars along the shores of some lakes are pruned to the height a deer can reach in feeding. This sharp browse line looks like a high-water mark made by the lake in flood. Deer also are found in the prairie country where annual seasons are held to keep the herd in balance and to prevent crop depredations. Minnesota's deer hunters spend about $17½ million a year on their sport, or about $75 a hunter.

At one time, poaching almost depleted the State's moose herd. In recent years, complete protection coupled with more efficient law enforcement has brought the moose herd from a low of about 200 animals to more than 7,000. The animals are scattered over 17,000 square miles, half of which is prime moose range. Moose were last taken legally in Minnesota in 1918, but efforts are being made to open a limited season on them.

Small Game

The most abundant, most sought after, and most heavily harvested upland game bird in Minnesota is the introduced Chinese ringneck pheasant. From large-scale stocking programs carried out in the 1920's, a hardy brood stock—adapted to the prairie farmland environment—has developed, and up to a million of the gaudy cocks are harvested annually.

Ranking high with the sportsman is the native

ruffed grouse, a forest dweller, often called "partridge" by scattergunners. From a quarter million to more than a million are shot annually. As with the ringneck pheasant, hunting pressure seems to have little effect on ruffed grouse numbers. Sharptailed grouse and Hungarian partridge are also hunted. The season is currently closed on pinnated and spruce grouse and bobwhite quail.

Small game animals provide outdoor recreation for a great number of hunters. More than a quarter

Pits were blasted in this wetland to make it a more appealing habitat for waterfowl, ducks in particular.

million cottontail rabbits and nearly a half million squirrels are shot during an average fall season. Raccoon and gray and red foxes provide hunting for more specialized groups of hunters, including hound owners and outdoorsmen interested in the popular sport of predator calling. A hunter usually bags 8 to 10 of these small game animals during the fall season. More than 10,000 beaver pelts are taken annually. Beaver is found throughout the State but is most common in the northern forests.

Waterfowl

Minnesota is one of the top three duck-producing States in the country, containing an important segment of the Nation's prairie pothole production habitat. Drainage of these wetlands began in the 1850's and has continued ever since. Within the last 25 years, about a million acres in Minnesota which were valuable to waterfowl have been drained.

Today, the State's wetlands produce from one-half to three-quarters of a million ducks annually, while its 150,000 hunters bag up to a million ducks during the fall flights—about a tenth of the Nation's annual duck harvest and a fourth of the waterfowl harvest in the Mississippi flyway. A sizable part of the $90 million spent annually by the country's waterfowl hunters is spent in Minnesota.

To counter the detrimental effects of drainage on duck production, Minnesota added a dollar fee to the small-game hunting licenses several years ago and earmarked this money for wetlands acquisition and preservation. To date, slightly more than 178,000 acres of prime wetlands have been acquired by the State, but conservationists believe that an additional 670,000 acres of wetlands should be acquired and protected by the State Conservation Department. This program is closely coordinated with the Federal wetlands preservation program and both focus primarily on wetlands in western Minnesota.

Three major goose species—Canadas, blues, and snows—move through all sections of the State during migration, but the heaviest flights occur along Minnesota's western border. In recent years, the division of Game and Fish in the State's Department of Conservation has undertaken intensive goose management programs in cooperation with the Federal Bureau of Sport Fisheries and Wildlife, and breeding flocks have been started in several areas. A network of State and Federal refuges provide protection for migrating waterfowl and recreational opportunities for hunters. The State now has 630 wildlife management areas totaling some 850,000 acres.

Sport Fisheries

Minnesota's sport fishing is nationally famous and is responsible for a major part of the State's multimillion dollar resort industry. Nearly 1.5 million sport fishermen, including about 300,000 nonresidents, spend an estimated 50 million hours and $100 million a year to catch 50 million fish in Minnesota. The game fish harvest amounts to about 25 million pounds or 32 fish from each acre of the State's fishing waters.

Walleyes are the most sought-after game fish, but panfish are the "bread and butter" species to the Minnesota angler. Panfish (which represent a number of species) are harvested in greater numbers and the greatest total poundage, although the northern pike found statewide, leads all species in poundage taken.

Lakes in the southern part of the State are shallow

and usually support bass, bluegills, perch, bullheads, and crappies—fish that tolerate warmer water temperatures. In the deeper, cooler lakes are found the walleyes, muskellunge, and suckers, while the cold-water lakes support the native lake trout as well as the rainbow, brook, and brown trout. The sauger, called the "sand pike" but most closely related to the walleye, is found in the larger rivers and in some northern lakes. Members of the catfish family, the channel catfish, the shovelhead or mud catfish, and the blue catfish, are primarily confined to the larger streams and rivers of southern Minnesota. However, channel catfish are also found in the St. Louis River in Duluth.

Fish for Livelihood

The commercial fishery resources of Minnesota are intensively utilized. During recent years, almost 1,000 commercial fishermen have harvested some 16 million pounds of fish annually, valued at about $1 million. The primary commercial species landed include smelt and herring on Lake Superior; tullibees, walleye, and yellow perch on Red Lakes and Lake of the Woods; and carp, buffalofish, and bullheads on the Mississippi River and inland lakes.

While not considered a part of the commercial fishery, minnow production is an important segment of the State's fishery resource. Minnesotans raise and sell about 100 million minnows a year. Of these, about $7 million worth are sold to Minnesota anglers and about $1 million worth go to out-of-State markets.

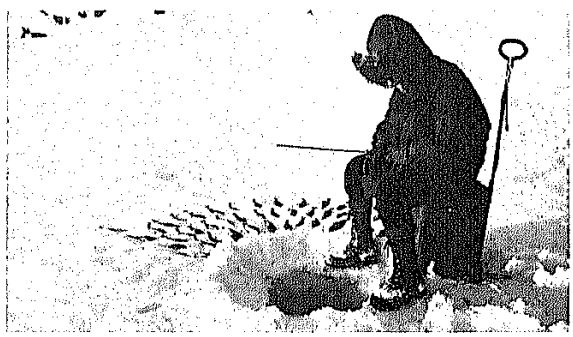
Fishery Management

A wide variety of fishery management and research programs are being carried out by Minnesota to maintain or improve commercial and sport fishing. These programs include lake and stream protection and restoration projects, acquisition of northern pike spawning areas, rough fish removal, the operation of State fish hatcheries and rearing ponds, as well as scientific studies seeking basic information and tools for better fish management.

The State now operates more than 1,200 access areas to public fishing waters, numerous modern fish hatcheries, plus a network of 183 State and cooperative walleye rearing ponds and 131 northern pike spawning areas that produce nearly 300 million fish weighing more than 400,000 pounds for stocking the public waters of Minnesota each year.

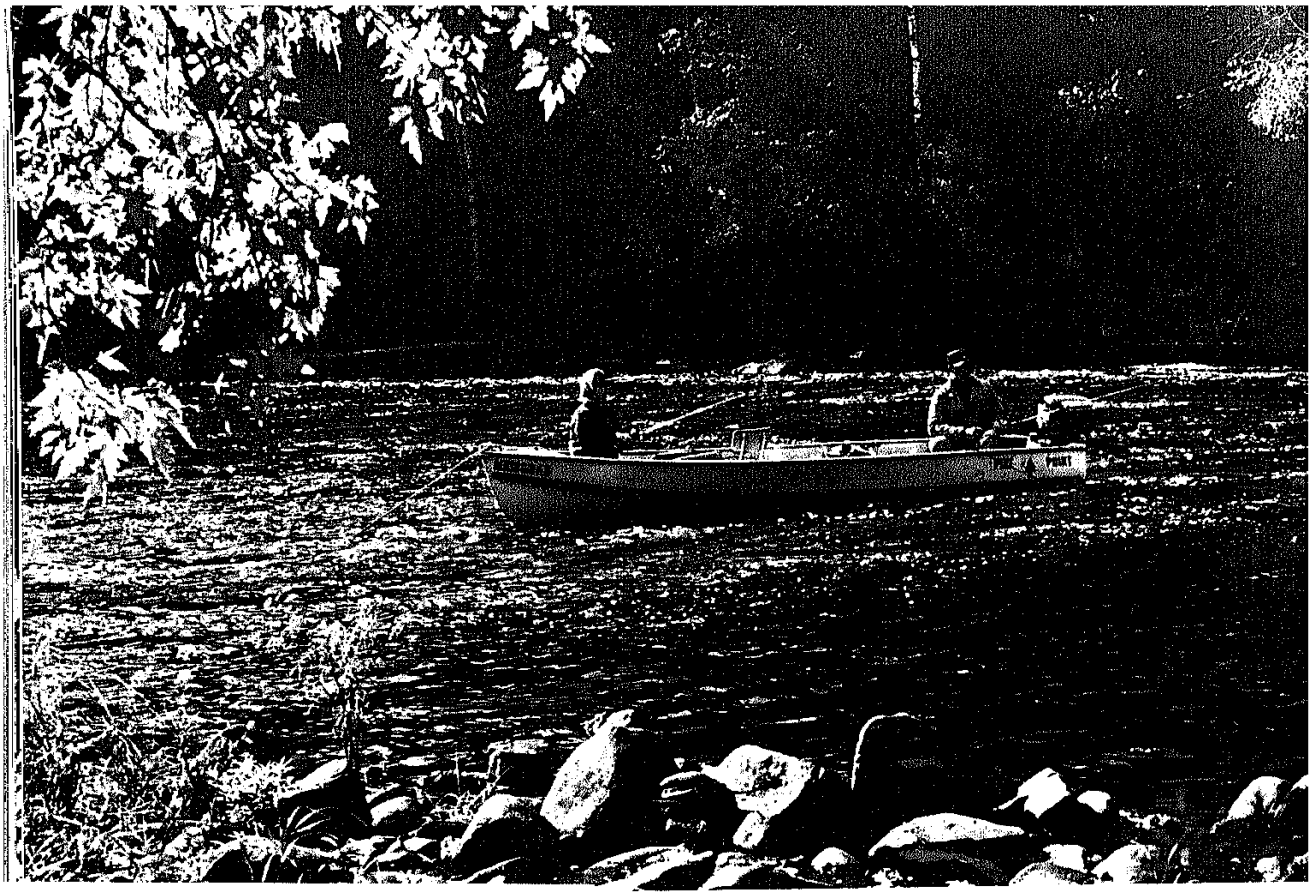
In 200 to 300 of Minnesota's smaller lakes and rivers, nongame fish (rough fish) are harvested to reduce predation and the competition for food and space these species exert on sport fish.

Minnesota also has undertaken cooperative efforts with Federal and Canadian fishery agencies such as the Great Lakes Lake Trout Rehabilitation Program and sea lamprey control. The sea lamprey, which almost destroyed the valuable lake trout fishery, has been steadily reduced and the lake trout population is recovering through a massive stocking effort carried out cooperatively by the Lake States, the Province of Ontario, and the Federal Government. In 1967, the Federal Bureau of Commercial Fisheries recorded that the sea lamprey population in Lake Superior had been reduced 29 percent since 1966.



Though this fisherman used a spud to chop a hole through the ice, some fishermen use gasoline-powered drills.

Minnesota's fish managers face a multitude of management problems. Each winter, about 50,000 larger fish, weighing up to a quarter of a million pounds, must be rescued from waterfowl areas and restocked. Intensive farming and industrialization cause pollution and siltation that destroy or damage spawning areas, raise water temperatures, eliminate beneficial vegetation and food organisms, encourage undesirable weed growth and rough fish species, and otherwise damage good fishing habitat. Drainage of potholes destroys spawning beds and the clean water that game fish need. Moreover, as fishing pressure increases and lake-front property values rise, providing access to fishing waters becomes increasingly difficult.



Parks and Recreation

Minnesota is a year-round vacationland. In the summer, visitors can enjoy water sports on the thousands of lakes that honeycomb the State. In the winter, skiing, ice skating, ice hockey, tobogganning, and ice boating are available. Fishing is always in season; and hunters are lured to Minnesota every fall.

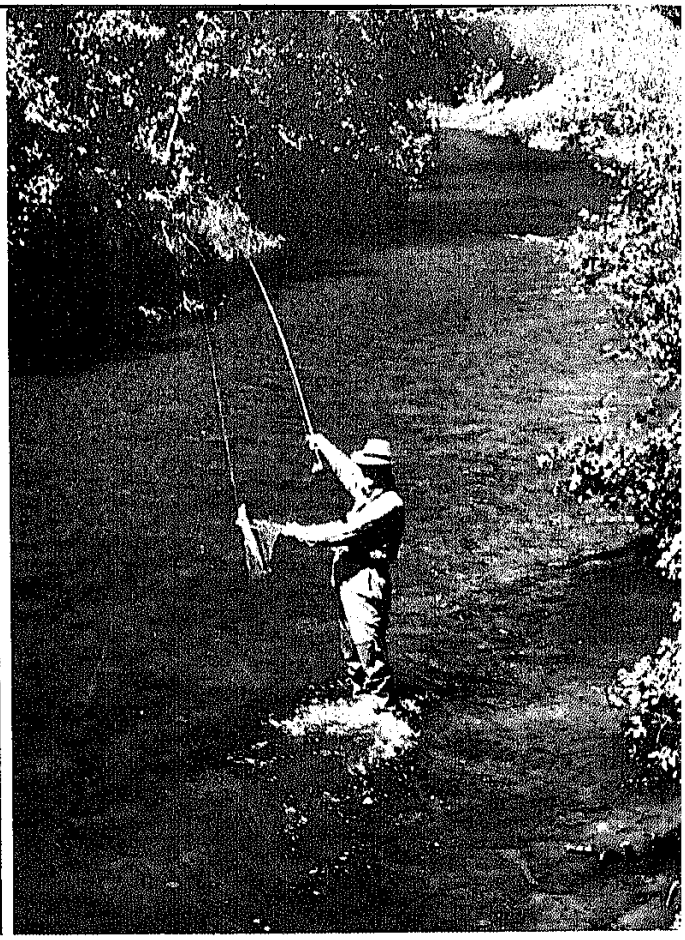
Not only does each season bring new recreational activities, but each section of the State has its own special attractions. From the elaborate Winter Carnival held in St. Paul and the Aquatennial held in Minneapolis, to Indian ceremonies, logrolling contests, and sailboat races, there is something to interest everyone.

eauty of the countryside provides entertainment enough for many outdoorsmen. Roaring waterfalls, rocky cliffs along Lake Superior's North Shore Drive, and the "wilderness" of the Boundary Waters Canoe Area, all are scenic adventures not to be missed.

National Monuments

Minnesota boasts two unique national monuments—Pipestone National Monument and Grand Portage National Monument—administered by the National Park Service.

Located in the southwestern corner of the State, *Pipestone National Monument* was developed to preserve the ancient pipestone quarries where for at



Minnesota's sport fishing is nationally famous and is responsible for a major part of the State's multi-million dollar resort industry.

least three centuries a large proportion of the ceremonial pipes used by the American Plains Indians and other tribes was produced.

Since 1937, use of the stone has been reserved by Federal law for the American Indian, and stone is quarried each year under special permits issued by the National Park Service.

Development of the monument has included a new visitor center, trailside and roadside interpretive exhibits, and improvement of trails and landscaping. The monument may be reached via U.S. 75 and Minnesota 23 and 30. It is about a mile north of the city of Pipestone where food and overnight accommodations are available.

On the site of the old North West Company depot in northeastern Minnesota stands the reconstructed stockade of *Grand Portage National Monument* in a setting much the same as during the fur-trade era.

This monument preserves the legends of the 18th and early 19th centuries, the period when the French-Canadian voyageurs paddled and portaged thousands of tons of trade goods and furs over the 3,000-mile waterways extending from Montreal to Fort Chipewyan on the shores of Lake Athabaska, deep in the Canadian wilderness.

The 9-mile portage which today bisects the reservation of the Grand Portage Band of the Chippewa Tribe, was a vital link in the trade from Montreal.

The national monument, on U.S. 61, is 38 miles from Grand Marais, Minn., 151 miles from Duluth, Minn., and 45 miles from the Canadian cities of Fort William and Port Arthur, Ont.

No camping or overnight accommodations are available at either area.

Recreation in National Forests

Two national forests lie within the State of Minnesota: the Superior National Forest in the extreme northeast corner and the Chippewa National Forest in the north-central part of the State. These forests offer a wide variety of recreational opportunities, and in recent years they have averaged more than 2 million visitor-days use.

In both national forests, visitors enjoy fishing, swimming, boating, and canoeing in the summer; and skiing, tobogganing, snowshoeing, ice skating, and ice fishing in the winter. Deer and small game are abundant and may be hunted under State regulations.

Superior National Forest (2,040,344 net acres) has its headquarters in Duluth. This forest, which includes more than one million acres of virgin forest, has 5,000 lakes with rugged shorelines, picturesque islands, and sand beaches.

The northern third of the Superior National Forest—the Boundary Waters Canoe Area—is territory without parallel the world over. Covering approximately one million acres of Federal, State, county, and private lands and waters, this area stretches more than 100 miles along the Canadian border. North of the international border is Quetico Provincial Park, maintaining a management plan similar to that of the Boundary Waters Canoe Area. The area offers the finest canoe country in the United States and is the site of historic explorations by the French voyageurs.

By definition, the Boundary Waters is not a wilderness area since in a true wilderness timber harvesting is not permitted nor is mechanical transportation allowed. In some portions of the Boundary Waters Canoe Area timber harvesting is allowed, although in others, notably wide strips along the scenic waterways, it is not. Where timber cutting is allowed, some types of motorized equipment (such as trucks for the removal of timber) may be used. Also, motorboats may continue to be used in areas of the Boundary Waters where they have become an established means of transportation; snowsleds and other vehicles are permitted to use the waterways when they are frozen; and a few "mechanical" portages are still in operation.

The Forest Service maintains 414 camping sites within the Superior National Forest, of which 56 are qualified campgrounds and the balance are "minimum necessity" camping areas—mostly along the Boundary Waters Canoe routes. Other forest facilities include 14 picnic areas, six swimming developments, 23 boating sites, one winter sports area, and the Voyageur Visitor Center. Nearby towns are Duluth, Ely, Grand Marais, International Falls, Two Harbors, and Virginia. The forest may be reached by U.S. 53 or 61 and Minnesota Highways 1, 35, 73, or 169.

Chippewa National Forest (644,247 acres net) has its headquarters at Cass Lake. Here, close to the headwaters of the Mississippi are hundreds of lakes including Lake Winnibigoshish, Leech Lake, and Cass Lake. The forest is the home and present headquarters of the Chippewa Indians.

Facilities include 25 camping sites, 23 picnic grounds, 12 swimming developments, 23 boating sites, and one winter sports area—the Shingobee. Reached from U.S. 2, 71, or 371 and Minnesota Highways 6, 38, or 46, the forest is within easy driving distance of such Minnesota towns and cities as Bemidji, Blackduck, Deer River, Grand Rapids, Remer, and Walker.

National Wildlife Refuges

The primary use of national wildlife refuges is the production and protection of wildlife. In addition, opportunities for fishing, hunting, birdwatching, sightseeing picnicking, swimming, camping, and boating are afforded on the five refuges in Minnesota.

The *Upper Mississippi River Wildlife and Fish Refuge* is one of the oldest refuges in this region, having been established in 1924. This refuge is noted for the spectacular flights of waterfowl which pass through each spring and fall and for scenic views of the Mississippi River. *Sherburne National Wildlife Refuge,* the newest refuge in Minnesota, is within an hour's drive of the Twin Cities. Land for this refuge is still being acquired.

National wildlife refuges are administered by the Department of the Interior's Bureau of Sport Fisheries and Wildlife. More information on these refuges may be gotten from the section "Programs—Bureau of Sport Fisheries and Wildlife" of this book.

Recreation on Indian Lands

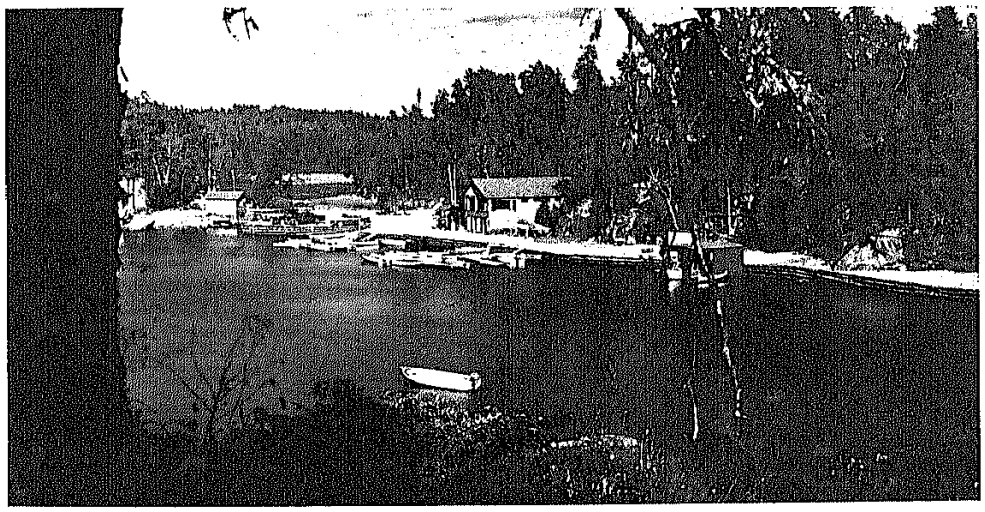
The seven Chippewa Indian reservations in Minnesota are in major recreational areas, lending themselves ideally to tourism and recreation development. The 499,933 acres of lakes and ponds on reservations encourage development of cabin sites and boating and fishing facilities; hand-gathering of wild rice on some reservations and Indian festivals, museums, and arts and crafts shops attract tourists.

State Owned Facilities

In addition to the waysides, monuments, and forests which are State owned, Minnesota has 63 State parks. The parks vary greatly in size, from St. Croix, with 30,702 acres to Zippel Bay, with only 26. At Tower Soudan, one can see Minnesota's deepest and oldest underground iron mine; Fort Ridgely is the site of some of the fiercest fighting during the 1862 Sioux uprising; and at Interstate, there is a "Glacial Garden" of unusual geologic rock formations. Many of the parks are situated on beautiful lakes or streams which provide fishing, boating, and swimming opportunities. Picnic grounds and campgrounds are usually available. A number of parks are being enlarged under the grants-in-aid program of the Federal Land and Water Conservation Fund Act.

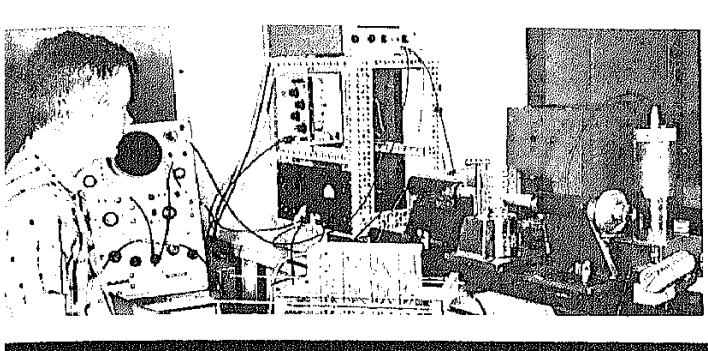
Privately Owned Recreation Facilities

Privately owned recreation facilities provide a wealth of opportunities for the outdoors enthusiast. Ski resorts offer challenges to both the novice and the pro. For those more sedentary, an old-fashioned sleigh ride may be enjoyed. Privately owned campgrounds are scattered throughout Minnesota and rates are usually reasonable. Cabins may be rented in many scenic areas.



Calm water is a welcome tranquilizer for those retreating from our fast-paced cities.

Lists of all the privately operated recreation facilities in Minnesota are not available from any single source. Travel bureaus and agencies, commercial organizations such as motel and hotel associations, gasoline companies, airlines and railroads, local chambers of commerce, and outdoors clubs and organizations can supply information on many of the privately owned facilities. Local inquiry will reveal others. Information is also available from the Minnesota Department of Business Development, State Capitol, St. Paul, Minn. 55101.



(Left) Thousands of drill-core samples are stored in the Bureau of Mines core "library" in Minneapolis. (Above) A scientist obtains data that will lead to new and improved mining methods. (Right) Eggs are stripped from a female muskie.

Corps of Engineers can be obtained by writing the U.S. Army Engineer District, St. Paul, 1217 U.S. Post Office and Customhouse, St. Paul, Minn. 55101.

Bureau of Commercial Fisheries

The Bureau of Commercial Fisheries is part of the Department of the Interior's Fish and Wildlife Service. It has a major interest in commercial fishery research and development including biological, technological, exploratory fishing, and marketing investigations. The Bureau has become increasingly involved in water resources planning projects in Minnesota, including comprehensive river-basin studies.

In cooperation with the State of Minnesota, the Bureau of Commercial Fisheries annually collects, analyzes, and disseminates statistics on the State's annual catch of commercial fish.

Programs to increase the use of fish are being conducted throughout the Midwest. These programs strive to improve the quality and popularity of fishery products and to emphasize the dietary value of fish. Many of Minnesota's commercially produced fish species are being promoted.

Bureau research and field work play an important role in control of the sea lamprey on Lake Superior. Control of this predator and restoration of lake trout stocks greatly benefit the commercial fishing industry of the lake, including that portion in Minnesota. The Bureau also provides technical assistance to commercial operators on Lake of the Woods.

Under the cost-sharing provisions of Public Law 88–309 (the Commercial Fisheries Research and Development Act), which is administered by the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife, Minnesota is currently conducting two commercial fishery research projects. One project is obtaining life history information on species associated with the lake herring. Another is developing echo-ranging techniques for locating fish beneath the ice.

Additional information may be obtained from: Regional Director, Bureau of Commercial Fisheries, 5 Research Drive, Ann Arbor, Mich. 48103.

Federal Water Pollution Control Administration

The Department of the Interior's Federal Water Pollution Control Administration seeks to enhance

and protect water quality for public supplies, fish and wildlife propagation, recreation, agriculture, industry, and all other legitimate uses of the water resource. This is accomplished through a system of monetary grants to the State for betterment of its water pollution control program; to communities as incentives for construction of local waste treatment facilities; to colleges and universities in support of research and training; and to industries, cities, and other entities for projects seeking to answer particular problems in wastewater control and disposal.

Federal Grants

Federal grants of approximately $150,000 a year at present make up a sizable portion of the State's annual budget for water pollution control. In addition to the money paid to the State, towns and cities in Minnesota have received FWPCA grants of $17.2 million to aid in constructing 195 waste treatment projects costing $71.4 million for the control of municipal pollution. And, at three institutions of higher learning—the University of Minnesota, Winona State College, and St. Mary's college—a total of 11 water pollution research projects and training programs in sanitary engineering are currently receiving grant support approximating $200,000 a year. The Minnesota State Health Department is utilizing still another FWPCA grant to demonstrate the usefulness of the channel aeration process in the treatment of sewage.

Under recent legislation, the Minneapolis-St. Paul Sanitary District has received and is matching a Federal grant of $870,750 awarded for a special project. The project seeks to develop and demonstrate new control methods for overflows from the Twin Cities' combined sanitary-storm sewer system, an increasingly troublesome factor in stream pollution in many cities.

The Clean Water Restoration Act of 1966 gave a first-time, indirect subsidy to industrial waste treatment. At Minneapolis, the North Star Research and Development Institute is using a $76,585 grant from FWPCA to demonstrate new waste treatment methodology for the food processing industry. The community of South St. Paul has received a $450,000 grant to determine the efficiency and economy of [illegible]eric sewage clarification in a system which will jointly treat municipal, industrial, and combined storm-sanitary sewer wastes.

Research and Technical Services

Minnesota has often called upon the special research skills and technical services of the FWPCA. For example, at the request of Minnesota's Governor, the FWPCA's Cincinnati Water Research Laboratory not long ago conducted technical investigations of two major oil spills on the Minnesota River which caused great losses of wildlife and damage downstream on the Minnesota and Mississippi Rivers. The incidents pointed up a need and resulted in passage by the Minnesota legislature of a greatly strengthened pollution control law.

The oil spills also led the Governors of Minnesota and Wisconsin to request Federal enforcement action on the interstate waters of the Upper Mississippi. This action resulted in a 3-year, half-million dollar study by FWPCA to pinpoint the sources and extent of pollution in 273 miles of these basin waters, principally in the Twin Cities area. The offending communities and industries are now under mandatory time schedules for abating the water pollution they create.

A second interstate stream, the Red River of the North, has been the target of similar FWPCA enforcement action involving North Dakota and Minnesota.

FWPCA laboratories are being built to supplement the older research establishment at Cincinnati. One of these, known as the National Water Quality Laboratory, opened in 1967 at Duluth. At full complement, it will maintain a staff of 130, most of whom will be the scientists and other experts necessary to conduct highly specialized studies in water quality requirements. Minnesota will be served also by two FWPCA field laboratories to be located in the neighboring States of Michigan and Wisconsin. These establishments will conduct research and training fitted specifically to regional water pollution problems of the Great Lakes and the upper Plains States.

At Ely, Minn., the FWPCA is pursuing a most significant research and development effort, the Shagawa Lake Eutrophication Control Pilot Project. Shagawa and other lakes of the Boundary Waters Canoe Area have shown signs of overfertilization

and excessive algae growth since the 1930's. If the Ely project can stem the "aging" of these beautiful and heavily used recreational waters, it will set a useful pattern for many waterbodies similarly afflicted.

Pollution Control

The FWPCA bases its recommendations for long-term maintenance of suitable water quality upon comprehensive river basin studies of water usage, waste disposal, and future water needs. Three of these studies, which are made in cooperation with other water resource agencies, have now blueprinted pollution control programs for Minnesota—the Great Lakes, the Missouri, and the Upper Mississippi Basins studies.

Under present technology, even the best conventional treatment of all wastewaters discharged to a stream is not always sufficient to maintain the desired instream quality. Thus, the Federal program recognizes streamflow regulation—dilution—as a second line of defense against pollution. The FWPCA has determined the storage volume needed in proposed Federal reservoirs on the Minnesota River and the Mississippi River headwaters for downstream flow regulation and control of water quality. The people of the two basins should reap annual benefits from this "clean water" feature estimated at several million dollars.

As required by the Federal Water Quality Act of 1965, Minnesota established quality standards for her interstate waters in 1967, subject to Federal approval. The standards identify uses of waters, including agricultural, municipal, industrial, recreational, and fish and wildlife use; indicate the water quality necessary to support each use; and include plans to implement and enforce these standards.

The FWPCA maintains water pollution surveillance systems to monitor water quality in all major basins. In Minnesota, for example, sampling stations are maintained at strategic points in the Twin Cities area along the Mississippi and Minnesota Rivers, on the Rainy River at Bandette and at International Falls, and on Lake Superior at Duluth. Water quality data from all sources is fed into FWPCA's storage and retrieval system and computer center for use by all having need of such information.

The FWPCA effort to control water pollution from Federal properties and from boats and vessels operating in U.S. waters has been given the impetus of a recent executive order from the President. Minnesota's 336 land-based Federal installations have been found to be discharging only a minor percentage of their wastes without adequate treatment. In these instances, the FWPCA is providing technical assistance, if needed, and corrective steps are being taken.

At the request of Congress, the FWPCA in 1967 surveyed and recommended legislation to curb the growing problem of pollution from boats and ships. The use of both pleasure and commercial craft in Minnesota waters is extensive and here, as elsewhere, a strong effort must be made to reduce pollution from this source.

To facilitate its work in the Upper Mississippi River Basin, the FWPCA maintains a program office at the U.S. Naval Air Station in Minneapolis.

For general information about the Federal water pollution control program in Minnesota, address the Federal Water Pollution Control Administration's Great Lakes Regional Office, 33 East Congress Parkway, Room 410, Chicago, Ill. 60605.

U.S. Forest Service

In 1902, the U.S. Congress, in unprecedented action, established the Minnesota Forest Reserve on some 200,000 acres of coniferously wooded hills at the headwaters of the Mississippi.

First national forest to be set aside by act of Congress, this tract of land in northern Minnesota was established to save the area from the depredations of unprincipled timber operators. Subsequently, the forest was renamed the Chippewa—after the Indian tribe. In 1909, a second national forest was established in Minnesota—the Superior, in the northeastern "Arrowhead" section of the State.

The Forest Service of the Department of Agriculture administers these two national forests so that their many natural resources may most benefit the American people on a continuing basis. The Forest Service also conducts research on forest management and protection at a number of project locations in Minnesota. In cooperation with State natural

resource organizations, the Forest Service offers assistance to private and industrial foresters in the State.

Today, Minnesota's two national forests cover a total gross acreage of 4,343,852 acres—an area only slightly smaller than the combined acreage of the States of Connecticut and Delaware. Each of these forests is administered by a forest supervisor under the direction of the Forest Service Regional Forester in Milwaukee, Wis.

National forest land in Minnesota includes 1,947,-100 acres of commercial timber. Predominantly coniferous (spruce, balsam, cedar, and pines—red, white, and jackpine), these northern forests are interspersed with a liberal sprinkling of hardwoods, notably aspen but including also birch, maple, ash, willow, nut, and cherry.

More than three billion board feet of sawtimber is growing on Minnesota's national forests. Timber cut on these forests during 1966 was 148,968,000 board feet. In the past, this timber was used mainly for pulp and fuelwood, but in recent years, under careful management, new uses have been introduced and the harvest has increased in value.

In addition to wood fiber, Minnesota's trees yield nuts, maple syrup, cones, etc. A unique resource found in the marshlands of the Chippewa National Forest is the famous wild rice crop, handgathered today by the Chippewa Indians just as it was long before the first voyageur paddled the Mississippi River.

Perhaps the foremost resource of Minnesota's forests is scenery and inherent recreation for the tourist. The forests annually attract thousands of visitors who hike, camp, hunt, fish, and enjoy a variety of water sports. The million-acre Boundary Waters Canoe Area, measuring more than 100 miles east-to-west, is located in the Superior National Forest.

Because of the pressures caused by steadily increasing tourist use and because of the necessity for maintaining a continuous yield from the magnificent timber stands, the Forest Service has drawn up a development program to intensify management and protection of the national forest land to insure the fullest enjoyment of the forests to the year 2000.

In Minnesota, this National Forest development program includes: enlargment of the popular Boundary Waters Canoe Area through acquisition of State or private lands already within its borders; reforestation of 165,000 acres and timber stand improvement of 440,000 acres; construction of 2,000 family camping units; construction or repair of 3,000 miles of roads, 35 miles of trails, and 700 miles of firebreaks; and fuel reduction on 14,000 acres.

Forest Service Research

In the endless search for new or more efficient methods of managing and protecting forest resources, Forest Service scientists working out of the North Central Forest Experiment Station are undertaking a wide variety of research.

A modern new office laboratory on the St. Paul campus of the University of Minnesota houses the station headquarters for a seven-State area. Research conducted here and elsewhere in the State includes studies of fire, insect, and disease control; wildlife habitat; site requirements of Lake State trees; economics and marketing of forest products; and conservation, social, and economic aspects of forest recreation. In addition, the Forest Survey program for this important timber region is centered at St. Paul.

The 2,254-acre Marcell Experimental Forest outside of Grand Rapids is the site of Forest Service research on bog and swamp hydrology—a little-known but extremely important feature of land management. The forest includes five bog watersheds from which considerable information is being gathered to determine the effects of various timber management and water control techniques on water yield from bog areas.

In Grand Rapids, Forest Service scientists are studying the silvicultural improvement of northern conifers and economic aspects of timber production, both in managing existing stands and in the establishment of new stands.

On the Duluth campus of the University of Minnesota, the North Central Experiment Station maintains a wood products marketing research project where opportunities for expanding northeastern Minnesota's manufacturing and marketing of wood products are analyzed.

State and Private Cooperation

The benefit of Forest Service knowledge and manpower is shared with State and private forest

owners in Minnesota, as elsewhere, through cooperative programs for assistance in forest fire, flood, and pest control; distribution of planting stock; control of forest disease; and general management assistance to the small forest owner.

In recent years, an average of 4,000 woodland owners in Minnesota have received State and Federal assistance in the management of some 40,000 acres of land. The Forest Service shipped more than 5.6 million trees from the Eveleth Nursery in the Superior National Forest during 1966, supplementing some 25 million sent by State and private nurseries to be used for reforesting public and private lands in Minnesota.

During the 12 months preceding July 1, 1967, the Forest Service cooperated in eradicating currant and gooseberry bushes on 1,525 acres to control white pine blister rust. In addition, pruning and excising to control the rust was done on 946 acres. No work was needed to control defoliating insects or bark beetles.

Assistance in the prevention and control of forest fires on State and privately owned lands is one of the foremost of the Forest Service's cooperative programs. In the early 1900's (during the period of the early timber barons), the virgin forests of Minnesota were swept by great conflagrations—the most recent of which, in 1918, seriously threatened to destroy the city of Duluth. Today, Federal, State and municipal agencies cooperate to provide protection for all of the State's forest area.

Further information on the activities of the Forest Service in Minnesota may be obtained from the Regional Forester, Eastern Region, 710 North Sixth Street, Milwaukee, Wis. 53203; Supervisor, Chippewa National Forest, Cass Lake, Minn. 56633; Supervisor, Superior National Forest, Duluth, Minn. 55801; Director, North Central Forest Experiment Station, Folwell Avenue, St. Paul, Minn. 55101.

Geological Survey

The Geological Survey of the Department of the Interior determines and describes the occurrence, availability, and quality of surface and underground water resources in Minnesota. These investigations, carried out in cooperation with other Federal agencies and the State, are aimed at the solution of water problems through wise management.

Basic facts on streamflow are continuously collected by the Geological Survey at 110 sites in Minnesota. Partial records of flow are collected at another 221 sites and records of the water level are maintained for 50 lakes. Water sampling stations for monitoring the chemical and physical quality of the State's surface waters number approximately 85. In addition, samples of water are periodically collected from 140 wells in major water-bearing units to check long-term changes in quality that may take place. Ground-water levels also are measured throughout the State.

The raw data from the networks provides information on day-to-day variations. Areal and interpretive studies seek to increase the usefulness of the data in the development and management of the water resources. The Geological Survey is now making a series of interpretive water reports that describe the entire State. These reports divide the State into 39 watersheds and present the characteristics of streamflow, availability and occurrence of ground water, and the chemical quality of surface and ground water. These tangible water resources are related to the entire hydrologic cycle through an analysis of climate, terrain, and the effects of man and his inventions on the watersheds.

Studies have determined that now or in the future some local areas in Minnesota will be short of water during extended periods of drought. In some of these areas, excess surface supplies are available during the winter and spring months. Storing this excess in the ground, through artificial recharge of water to the rock units, or in surface reservoirs is a possible solution to seasonal shortages.

Because of the importance of both water-based recreation and industrial and agricultural development, the wise management of water is a primary concern of all the people of the State. Statewide water resource investigations will provide the facts needed to conserve, develop, and manage water resources for the greatest benefit of all.

Topographic Mapping

The Geological Survey has published 7½-minute (1:24,000-scale—1 inch equals 2,000 feet) topo-

graphic maps for more than one-fourth of the area of the State. This mapping covers principally the urban areas of Minneapolis, St. Paul, Mankato, Rochester, Austin, and Duluth, and also the northeastern part of the State. The maps provide basic data for urban planning, mineral and water resource studies, and preliminary engineering investigations.

In addition, much of the State is covered by 15-minute (1:62,500-scale—1 inch equals about 1 mile) topographic maps. These maps are useful for less intensive land-use studies and for resources development. Almost 60 percent of the State is covered by 15-minute or 7½-minute maps.

The entire State is covered by maps of the 1:250,000-scale (1 inch equals about 4 miles) series. A State topographic map at 1:500,000-scale (1 inch equals about 8 miles) was published in 1963.

Most of the mapping in Minnesota at this time is being done in cooperation with the State Department of Administration under a program in which the cost is shared equally by the State and Federal governments. The pace of the program was increased significantly in 1966 and 1967 with the aim of completing 7½-minute topographic map coverage of the State by 1975.

Maps covering about 29,700 square miles are in the Minnesota program. Of this total, mapping of 26,800 square miles is financed under the cooperative agreement. The balance of the program is financed by Federal funds and includes revising of existing maps covering 1,200 square miles in the Minneapolis area.

As more 7½-minute topographic maps in the State are completed, the emphasis of the mapping program will shift to maintaining and revising these maps to keep them up to date and to insure their maximum usefulness.

Other Programs

The U.S. Geological Survey and the Minnesota Geological Survey are cooperating in a joint program to complete aeromagnetic maps for the entire State. Magnetic properties of exposed rocks in areas of known geology have been studied to make possible the meaningful interpretation of aeromagnetic data in the extensive drift-covered areas.

The chemical features of the Gunflint Iron Formation in northern Cook County are currently being investigated, and a comprehensive study of iron-bearing rocks in part of the Cuyuna district has been completed.

The Geological Survey presently supervises exploratory operations on 91 copper-nickel prospecting permits and two copper-nickel leases, involving a total of 93,313 acres. Preliminary development of the ore deposit has begun on the two leaseholds located near Ely, Minn. An exploratory shaft has been started which will eventually be sunk to a depth of 1,100 feet to test the mining and metallurgical characteristics of this large low-grade ore deposit.

Further information on activities of the Geological Survey in Minnesota may be obtained from the District Chief, Water Resources Division, U.S. Geological Survey, 1002 Post Office Building, St. Paul, Minn. 55101.

Bureau of Indian Affairs

Reservation lands comprise approximately 734,800 acres of Minnesota's land base. Most of this land, 682,100 acres, is tribally owned. The remaining 52,700 is in individual Indian ownership. An additional 28,554 acres of submarginal land is available to Indians for other than farming purposes. The principal reservations, all Chippewa, are:

Red Lake Reservation.—Located in northern Minnesota, this is the largest of Minnesota's Indian reservations, with a population of some 3,200. It is a "closed reservation"—that is, all lands within the reservation are owned by the tribal band as a whole. There is some farming on the reservation, however, commercial fishing, timber cutting, work at the tribally owned sawmill at Redby, and hunting are the chief sources of income. Red Lake offers fine fishing and hunting for sportsmen and adequate lodging adjacent to the reservation. The entire reservation is a sanctuary for the American bald eagle.

Two large areas of wildlife habitat on the Red Lake Reservation damaged by dredging of rivers for drainage have been restored. The developed areas should greatly augment the hunting of migratory bird; with fur-bearing animals returning to these

areas, trapping operations of the Indians will increase.

White Earth Reservation.—Situated in western Minnesota near Bemidji, the reservation is home to 2,550 Indians. Timberwork, construction, and seasonal farmwork are the major sources of employment. Some benefits are also derived from the harvesting of wild rice and maple syrup. The reservation has many lakes for boating, fishing, and swimming.

Nett Lake Reservation.—In northern Minnesota, it adjoins Kabetogama State Forest and Game Refuge and Koochiching State Forest and Game Refuge. Two wild rice processing plants are located on the Nett Lake Reservation; the harvesting and processing of wild rice in August attract many visitors. Employment is scarce on the reservation except during this 4-week harvesting season. Some Indians are employed in a small rug-making business. The reservation is considered one of the best duck hunting areas in the State; waterfowl hunting, boating, fishing, and swimming abound in the Pelican Lake area. Vermilion Lake Reservation, a part of the Nett Lake Reservation, is another popular tourist and resort area. The population of the Nett Lake Reservation is estimated at 665.

Leech Lake Reservation.—Near Bemidji, the reservation is entirely enclosed by the Chippewa National Forest. The economy of the reservation depends largely on forest products and tourist trade. Since these activities are mostly seasonal, unemployment exists, especially during the winter months. Many families derive some income from selling handmade arts and crafts articles such as birchbark souvenirs and beadwork. About 2,550 Indians live on the reservation.

Grand Portage Reservation.—Located in the extreme northeastern tip of the State along the Pigeon River on the Canadian border, it is the site of the historic Grand Portage National Monument. As reservation employment is limited, many Indians seek employment elsewhere for at least a part of the year. Some commute to jobs in the mines, on docks, and with the railroad. Local jobs consist of roadwork, fishing, timber hewing, and summer activities connected with the tourist trade. The reservation offers fine trout fishing in stream- and spring-fed lakes and deep-sea fishing in Lake Superior. The population is approximately 335.

The Grand Portage Band is proposing Grand Portage Indian park as a complement to the Grand Portage National Monument. This Indian park, if authorized by the Band, the Minnesota Chippewa Tribe, and the U.S. Government, will be of major recreational potential.

Fond du Lac Reservation.—Adjoining Fond du Lac State Forest and Refuge, it is noted for its numerous lakes, forest cover, and wildlife habitat. The Indians on the reservation are generally more prosperous than any other Indian group within the State because of the numerous work opportunities in a nearby major industrial center and in the mills at Duluth and Cloquet. The band operates a fish hatchery on the reservation. Approximately 850 Chippewa reside on the reservation.

Mille Lacs Reservation.—Located 100 miles north of Minneapolis-St. Paul on Mille Lacs Lake, sources of income include logging and timbering, sale of birchbark souvenirs, summer resort jobs, and conducting tours for visitors. It is a major resort and recreational area, with approximately 114 resorts and numerous lakeshore subdivisions for seasonal homesites. It is noted for its winter and summer fishing. The reservation population at present totals 820.

In addition to the above mentioned communities, there are: (1) four Sioux communities in southern Minnesota totaling 3,280 acres; and (2) Minnesota Public Domain Allotments of 905 acres.

When the proposed recommendations of a recent wild rice study are in actual practice, greater recreational development will result for the White Earth, Nett Lake, and Red Lake Reservations. Establishing more wild rice paddies is expected to improve the wildlife environment, and it is also anticipated that more tourists will come to view the harvesting of the wild rice.

Education

The State of Minnesota has assumed full responsibility for the education of all Indian children. The Bureau of Indian Affairs of the Department of the Interior maintains no schools of its own either off or on the reservations.

However, in order to meet special needs of the adult population, BIA conducts adult education programs on the Red Lake, Leech Lake, White Earth, and Mille Lacs Reservations. The Bureau has

also instituted a number of summer programs in the State for vacationing Indian students.

The Bureau supplements the scholarship aids available to Indians through their tribes, the State, and outside sources with approximately $25,000 yearly.

Forestry Program

The harvesting of timber provides an important source of income and employment for Indians in Minnesota. All cutting of reservation timber is administered by Bureau of Indian Affairs' foresters, working in cooperation with local Indian tribes. The forestry program of the Bureau also provides for the protection of forests from fire, insects, and disease; the Bureau will continue its efforts to expand markets for aspen which is in plentiful supply throughout the Indian-owned lands.

Additional information about the Indians of Minnesota may be obtained from the Minneapolis Area Office, Bureau of Indian Affairs, 1312 West Lake Street, Minneapolis, Minn. 55408.

Bureau of Land Management

In Minnesota the Bureau of Land Management has administrative jurisdiction over approximately 41,000 acres of public lands in 22 counties. About 97 percent is in Koochiching, Lake of the Woods, and Roseau Counties.

The lands in Koochiching County consist mainly of four blocks, some 20,000 acres of which were withdrawn by Executive Order 5003 of December 3, 1928, in connection with an agreement with Great Britain to control the water level in the Lake of the Woods and Rainy Rivers. The land is all located in a poorly drained area characterized by intermittent open marsh, grass, and low ridges timbered with spruce, tamarack, balsam fir, and associated species. Due to drainage problems, it is almost inaccessible and has little potential use.

During the past 10 years, most of the area has been cut over for small Christmas trees. Also, pulpwood from the area has been sold, however, pulp sales have been discontinued until it is determined what disposition is to be made of the land.

These lands could be used as a basis of exchange for State-owned lands within established or proposed Federal programs such as national forests, national parks, or national wildlife refuges. Such exchange needs, however, may take several years to develop.

At the present time, Federal land disposition in Minnesota is confined to small isolated tracts outside the north-central portion of the State. Dispositions are generally made to State agencies and counties for public uses.

In addition to lands identified as public land by surveys, there are known to be hundreds of islands in lakes and rivers that have never been surveyed. A few of these islands are being surveyed each year, as limited funds and manpower permits. At the present rate, it may take 50 years to complete the job.

A program of experimental blasting in selected marsh areas to improve feeding and nesting places for waterfowl and other wildlife species is being conducted by the Bureau of Land Management.

BLM lands in Minnesota are under the administration of the State Director, Bureau of Land Management, Billings, Mont. 59101.

Further information may be obtained from the Bureau of Land Management, Lake States Project Office, Room 203, Corps of Engineers Building, Canal Park, Duluth, Minn. 55802.

Bureau of Mines

For more than four and a half decades, the Department of the Interior's Bureau of Mines has been contributing to the advancement of Minnesota's thriving mineral economy. As the richest ores of the State become depleted and mineral requirements of the State and Nation expand, these contributions assume increasing importance.

Bureau research in mining and metallurgy develops improved methods for extracting and processing a variety of ores and other mineral-bearing substances. Bureau evaluations of the State's mineral resources help provide a sound and knowledgeable

basis for their conservation and development. And Bureau health and safety programs are a source of constant assistance in minimizing hazards in the mineral industries.

The Bureau's activities in Minnesota are carried on in close cooperation with State officials and with all segments of industry. Today, these activities are centered at a modern research installation in the Minneapolis-St. Paul area and at a health and safety field office in Duluth that serves the six-State area of Minnesota, North and South Dakota, Nebraska, Wisconsin, and Michigan.

Research

The Bureau's Twin Cities Research Center is one of the best equipped installations in the world for scientific investigations in mining and metallurgy. The findings of its scientists, engineers, and technologists are valued in many parts of the Nation and in foreign lands, but Minnesota, with its great metal mining industries, is the principal beneficiary.

Mining research performed at the Twin Cities center is both basic and applied. Besides studying the fundamental properties of mineral structure, such as the bonds that hold mineral crystals together and the forces that can break these bonds, Bureau experts are finding ways to improve efficiency and reduce costs in conventional mining practices such as drilling and blasting. In both kinds of research, the ultimate goal is the same: To hasten the necessary transition of mining from the status of an art to that of a science; to make mining more economical and thereby make possible the development of large resources of low-grade materials that cannot yet be mined and processed profitably.

A major Bureau effort in metallurgy, and one holding high promise, is aimed at bringing into production vast deposits of nonmagnetic taconite, useless at present but potentially a large source of iron. Unlike the magnetic variety of taconite which already is being mined and processed by industry, nonmagnetic ores cannot be treated with methods and equipment now available. Bureau scientists at the Twin Cities Center recently invented a promising technique for converting these nonmagnetic taconites into the magnetic kind by roasting them in the presence of scrap iron. This process may open an abundant new source of iron in Minnesota and at the same time enlarge the market for scrap.

In another important area of Bureau research on iron, progress is being made in efforts to improve the technology of conventional pelletizing. Studies now underway are emphasizing the conversion of iron ore into pellets—ideal blast furnace material—by a process that also removes some of the ore's impurities. Still other experiments, directed from the Twin Cities Center, are contributing new concepts and techniques in the making of pig iron. Already this work has pointed the way to more efficient operation of blast furnaces, showing how a better grade of pig iron can be obtained using less fuel.

Closely related to research on iron are Bureau studies of Minnesota's second most important metal—manganese. A process now under development to extract manganese from low-grade ores of the Cuyuna Range promises to make over 200 million tons of manganese-bearing material available for use in an emergency. Since the United States now must import nearly all the manganese it requires for steel-making, success in this Bureau project will significantly improve the Nation's defense posture.

The Bureau's economic and technical evaluations of Minnesota's mineral resources have made it an authoritative source of information needed by industry and by others concerned with full realization of the State's mineral potential. Resource evaluation studies are tied closely to Bureau research, and as work progresses on developing methods that will permit use of nonmagnetic taconites, reserves of these minerals are being inventoried in expectation of their increasing significance.

The Bureau also collects statistics on production, shipments, and other aspects of the mineral industry in Minnesota. This information, published regularly, helps the Bureau direct its research with maximum efficiency and provides industry with an up-to-date, comprehensive picture of developments throughout the State.

Health and Safety

Experts stationed at the Bureau's Duluth Health and Safety District Office cooperate with mineral producers to provide mine workers and officials with training in first aid, mine rescue, and accident pre-

vention. In addition to these continuing tasks, special assignments are undertaken from time to time. Typical of these is a study of dust conditions and their effect on the health of workers in the State's granite industry.

Additional information can be obtained from the Bureau of Mines, Twin Cities Research Center, P.O. Box 1660, Twin Cities Airport, Minn. 55111.

National Park Service

The National Park Service administers two areas in Minnesota—Pipestone National Monument (283 acres) and Grand Portage National Monument (770 acres).

For these areas, and the other units of the National Park System, the National Park Service has developed a long-range program to provide essential facilities and services for the visiting public. Tentative plans for Pipestone National Monument call for road and trail improvement projects and the installation of water and sewer lines. At both Pipestone and Grand Portage, special attention will be given to interpretive facilities and services.

At the request of the State, the National Park Service made a study of the Kabetogama Peninsula (about 12 miles east of International Falls in St. Louis and Koochiching Counties) and the surrounding lands and water adjacent to the boundary between the United States and Canada. This study resulted in a proposal to establish Voyageurs National Park.

This proposed park, an irregularly shaped area about 24 miles long from east to west, and varying in width from 3 to 5 miles, would contain approximately 108,000 acres of land and 60,000 acres of water.

The park—in the scenic lake country, still relatively free from manmade intrusions—would include a portion of the historic Voyageurs' Route, the route traveled by the rugged frontiersmen in search of furbearing animals. It would provide outstanding water recreation opportunities, particularly boating and fishing, in a wilderness of lakes and forests.

A number of legislative proposals have been introduced in Congress to preserve, for public use and enjoyment, the scenic St. Croix River in Minnesota-Wisconsin, including its principal tributary, the Namekagon River. But, Congress has not completed consideration of these proposals.

Additional information on programs of the National Park Service in Minnesota may be obtained from the Midwest Regional Office, National Park Service, 1709 Jackson Street, Omaha, Nebr. 68102.

Bureau of Outdoor Recreation

The Bureau of Outdoor Recreation in the Department of the Interior administers a program of grants-in-aid to States and their political subdivisions for outdoor recreation planning, acquisition, and development. This program, which requires States to match available Federal dollars, was authorized by the Land and Water Conservation Fund Act of 1965.

The fund has stimulated many kinds of recreation projects including areas and facilities for camping and picnicking, boating, hunting and fishing, ball fields, swimming pools, parks and seashore areas, hiking and riding trails, golf courses, tennis courts, ski lifts, and water impoundments. Thus far, 38 acquisition and development projects in Minnesota have been approved for Federal participation. An additional 93 projects are pending approval.

Money in the fund is derived largely from "pay-as-you-go" user fees and entrance charges at designated Federal recreation areas, from sale of surplus Federal real property, and the Federal motorboat fuels tax. The Federal recreation fee program promotes sale of $7 Golden Eagle Passports, year-long carload entrance permits to designated U.S. recreation fee areas. Proceeds from the sale of Golden Eagle Passports are deposited in the fund.

The Bureau of Outdoor Recreation does not manage any lands or recreation facilities. Its chief duties are to cooperate with the States, promote coordination of Federal programs, administer grants-in-aid, and develop a long-range, continuing nation-

wide outdoor recreation plan based on State, Federal, regional, local, and private plans.

The Bureau provides technical assistance to the States in preparation of the statewide recreation plan which the State must have to qualify for matching fund grants. This plan provides guidelines for future development by individuals, private organizations, cities, boroughs, and units of State.

The Governor of Minnesota has designated the commissioner of the Minnesota Conservation Department as liaison officer for the State in working with the Bureau of Outdoor Recreation in State-Federal programs.

Additional information may be obtained from the Regional Director, Bureau of Outdoor Recreation, Lake Central Region, 3853 Research Park Drive, Ann Arbor, Mich. 48104.

Soil Conservation Service

In Minnesota, the work of the Soil Conservation Service of the U.S. Department of Agriculture includes soil surveys, watershed protection and flood prevention projects, resource conservation development projects, river basin investigations, and farm conservation planning.

The SCS provides technical assistance to local soil conservation districts organized under State law. Through these districts, soil and water conservation practices are initiated, developed, and maintained.

In helping farmers develop a conservation plan, SCS conservationists make soil surveys of farms to determine alternative land uses. In addition to providing information for agricultural planning, soil surveys help determine the location and design of highways, aid urban development planning, and influence a wide variety of engineering undertakings.

SCS administers the Watershed Protection and Flood Prevention Act (Public Law 566). This act authorizes Federal assistance to organized local groups concerned with flood prevention, soil erosion control, irrigation, fish and wildlife conservation, outdoor recreation development, and municipal water supply.

Major river basin investigations are being made in cooperation with State agencies in the Upper Mississippi and Missouri River Basins.

Area SCS offices are located in Duluth, Fergus Falls, Marshall, Rochester, St. Cloud, St. Peter, and Thief River Falls. Work unit SCS offices are located in 84 towns, usually county seats, throughout the State.

Additional information may be obtained from local soil conservation districts or from the State office of the Soil Conservation Service, 517 Federal Courts Building, St. Paul, Minn. 55102.

Bureau of Sport Fisheries and Wildlife

The program of the Department of the Interior's Bureau of Sport Fisheries and Wildlife in Minnesota is keyed both to the primary responsibilities of the Bureau for the management and preservation of migratory birds and to participation in a variety of State fish and wildlife management programs. Many Bureau operations pertain to Federal lands within the State and to programs of wildlife management of national significance. State conservation agencies, the Bureau of Sport Fisheries and Wildlife, and other Federal agencies engaged in natural resource management work closely to coordinate their efforts.

Wildlife Refuges

Five national wildlife refuges are located in Minnesota. The sprawling *Upper Mississippi River Wildlife and Fish Refuge* extends for 284 miles along the Mississippi River from Wabasha, Minn., to Rock Island, Ill. About 33,000 acres of its 194,000 acres are in Minnesota. Some 270 species of birds, 50 species of mammals, and 113 species of fish occur in the Upper Mississippi River Refuge, and more than 3 million people visit the refuge annually to camp, boat, hunt, fish, or study birds. A total of 41,000 acres are closed to hunting to protect the spectacular flights of waterfowl which pass through each spring and fall.

The 61,000-acre *Agassiz National Wildlife Refuge* in Marshall County (formerly known as the Mud Lake Refuge) occupies a bay in prehistoric Lake Agassiz. As many as 60,000 ducks use the refuge marshes in spring and fall and resident Canada goose flocks have been developed under refuge management programs. Deer, moose, and a wide range of furbearers live on the refuge; local trappers capture about 8,000 muskrats in season from refuge marshes.

The 36,000-acre *Tamarac National Wildlife Refuge,* located in Becker County has nearly 10,000 acres of excellent marshlands that provide nesting and feeding grounds for waterfowl. Although two-thirds of the refuge is timberland, intensive development has increased the value of the refuge for producing ducks and geese as well as more upland game and deer. Hunting, fishing, and picnicking are permitted.

Rice National Wildlife Refuge in Aitkin County comprises 16,000 acres. In addition to its waterfowl, the refuge also has an abundance of upland game birds, furbearers, and big game. Fishing is permitted on parts of the refuge abutting the Rice River.

Sherburne National Wildlife Refuge in Sherburne County is located within an hour's drive of the Twin Cities. About 50 percent of the 30,000-acre site has been acquired. Visitor centers and interpretive trails will help make a trip to this refuge educational as well as recreational. Waterfowl, deer, and small game will be abundant.

Wildlife Services

The Division of Wildlife Services, in cooperation with the State Department of Conservation, State Department of Agriculture, and Cooperative Extension Service, provides technical advice and assistance in animal control, wildlife enhancement, and pesticides appraisal and monitoring.

Animal control activity is conducted primarily on an extension basis. Farmers and ranchers, public health authorities, sanitarians, homeowners, and others are provided information and instruction: (1) in safe and effective methods of controlling animals causing damage to crops, livestock, or property; or (2) on those activities that pose hazards to public health and safety.

Division personnel provide technical assistance and advice in conserving and developing fish and wildlife habitat on Indian reservations, national forests, military installations, and some private holdings. Development of a 10,000 acre waterfowl production and public shooting area on the Red Lake Indian Reservation and the protection of bald eagle nesting sites on thousands of acres of private forest holdings are examples of recent programs.

A pesticide appraisal program evaluates the effects of pesticides on fish and wildlife, in particular, and the environment, in general, and seeks ways and means of protecting these nontarget values. Periodic collections of fish and wildlife are analyzed to monitor long-range effects of pesticide residues.

Wetlands Preservation

Much of the Nation's effort to preserve duck-producing wetlands in the face of agricultural drainage has been concentrated in Minnesota, one of the three top duck-producing States. Minnesota possesses wetlands that are vital for the Nation's waterfowl. To protect an estimated 67,000 breeding areas totalling nearly 350,000 acres in 19 west-central Minnesota counties, the Bureau of Sport Fisheries and Wildlife and the State Department of Conservation are purchasing outstanding wetland areas or obtaining long-term leases to protect these areas from draining, burning, or filling.

River Basin Studies Program

The Bureau's River Basin Studies program is concerned with the effects of Federal power, irrigation, and flood control projects on fish and wildlife resources and with recommending appropriate steps to protect wildlife and fishery habitat or to develop and improve it. In Minnesota, river basin studies center around the Mississippi and Red River drainages.

In addition, stretches of several Minnesota streams have been studied for possible inclusion in the wild rivers system—a program to save the beauty and natural resources of some of America's unspoiled streams.

Other Programs

U.S. game management agents enforce wildlife conservation laws and regulations. They survey

migratory birds on breeding grounds in the United States and Canada and on wintering grounds of this country and Mexico. Management agents also investigate disease and poison occurrences among wildlife, check on depredation to farm crops, issue Federal permits to keep migratory birds captive, and carry on informational and educational activities.

Bureau fishery specialists work with the Upper Mississippi River Conservation Committee—composed of biologists from the States along the upper stretches of the river—in collecting fishing statistics, making life history studies of the native fish, and making pollution investigations.

A national fish hatchery located at New London produces about 1½ million fish annually for stocking numerous farm ponds and many of the larger lakes of the State. The fish produced are primarily largemouth and smallmouth bass, bluegills, northern pike, and walleye.

The Bureau of Sport Fisheries and Wildlife administers programs which supply Federal aid for acquiring wildlife lands and for research, among other things. In the 26 years since Federal aid for wildlife restoration began in Minnesota, more than $7½ million in Federal funds has been apportioned to the State for wildlife projects and programs.

Information concerning the Bureau's programs and activities in the State may be directed to the Regional Director, Bureau of Sport Fisheries and Wildlife, 1006 West Lake Street, Minneapolis, Minn. 55408.

Office of Water Resources Research

The Water Resources Research Act of 1964 (Public Law 88–379, as amended by Public Law 89–404, April 1966) is administered by the Office of Water Resources Research (OWRR) of the Department of the Interior. This law established one of the newest of the Federal-State programs dealing with natural resources. Focal point in the program, which deals with research and training, is an approved water resource research center or institute in each State and Puerto Rico.

The center at the University of Minnesota is one of these 51 institutes that receive annual allotments from OWRR to promote research and training in the water resources field. Funds for matching grants for the support of specific research projects submitted by these institutes are available on a competitive basis.

As might be expected in a State with so many lakes, the Minnesota center has devoted considerable attention to research on lakes and potholes. But problems related to ground water sources, watershed management, water law, and water quality have been studied too. One study deals with the effect of pothole drainage upon ground water resources. Other studies deal with the production of algae and other minute forms of plants and animals in relation to the chemical and physical characteristics of lakes; with eutrophication or aging processes in lake; and with the relation of phosphorus in lake bottom deposits to eutrophication. In yet another study, an attempt is being made to develop methods of integrating water quality management with the management of the total water resources in Minnesota.

The center maintains close contacts with other colleges and universities within the State having competence in water resources research and training, and keeps advised on local and State water resources research needs.

The Water Resources Research Act also authorizes appropriation of Federal funds through matching grants or other arrangements, to public agencies, institutions, private industry or individuals for research on selected water problems related to the mission of the Department of the Interior. The Lower Minnesota Watershed District, Burnsville, Minn., received a contract for study of the economics of flood control structures.

The two primary products of the Water Resources Research Act—research results and trained personnel—should be of increasing importance to effective water resources management in Minnesota.

Additional information on the activities of the Office of Water Resources Research pertaining to Minnesota may be obtained from the Director, Water Resources Research Center, University of Minnesota, Minneapolis, Minn. 55455.